Long Term Study Sites to Monitor Stream Channel Function

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Alaska Department of Fish and Game
Division o f Commercial Fisheries
Juneau, Alaska

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LONG TERM STUDY SITES TO MONITOR STREAM CHANNEL FUNCTION

By

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Southeast Region
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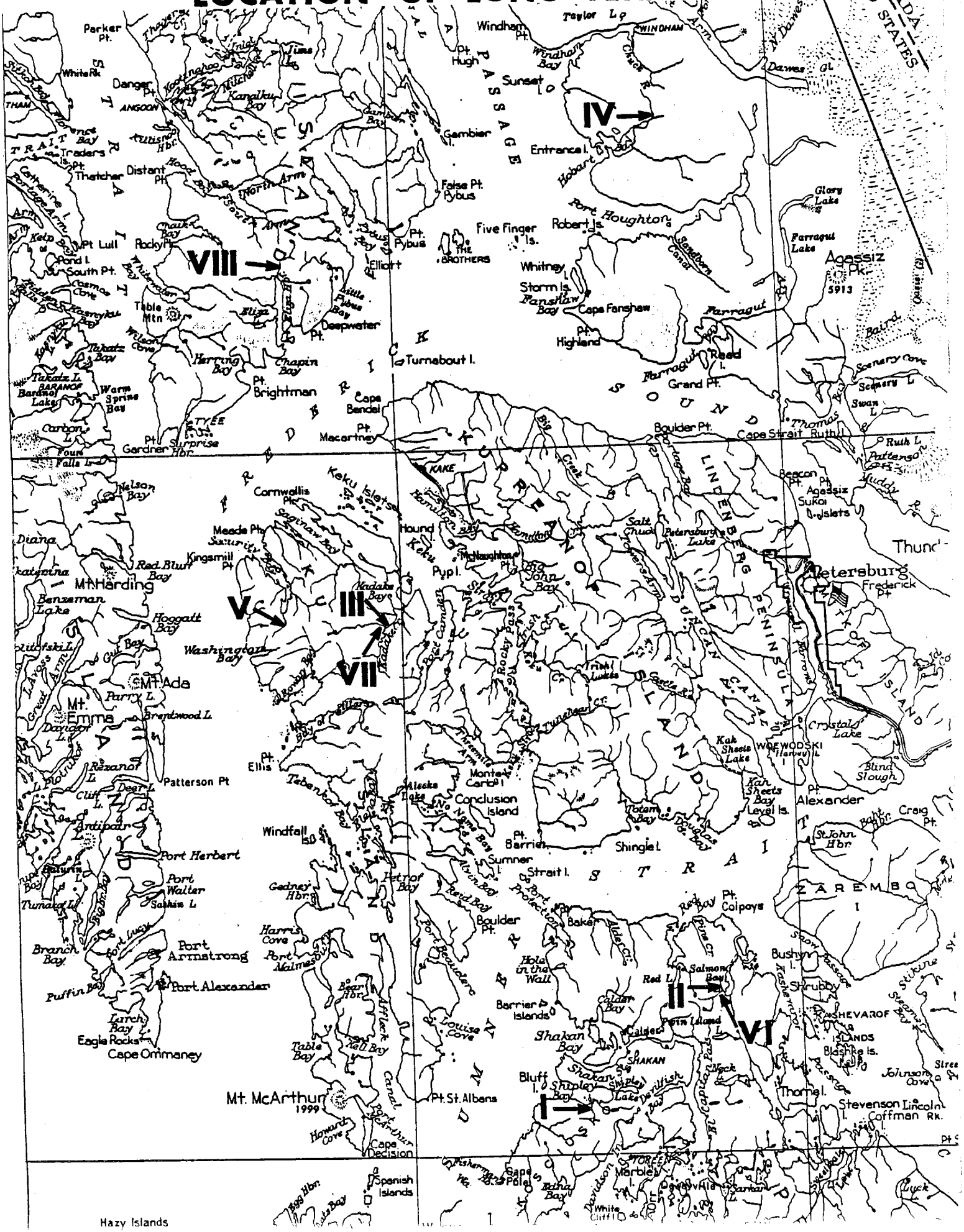
LOCATION OF LONG TERM SITES



Long Term Study Sites To Monitoring Stream Channel Function

INTRODUCTION

Channel type classification of all streams on the Tongass National Forest are now complete in those areas where upland management is planned. Also, most of the state and private land has been classified. With this data base now available, the Land Use Project started the long term monitoring of selected channels during the 1989 field season.

All types of channels will eventually be included in the study, however, only C-channels were selected this season because of their importance to spawning and rearing. A mix of watersheds from those with no logging to those with various amounts of logging were selected. In theory the stream channel under natural conditions should vary within the described characteristics of the channel type. For example, if the volume of large woody debris is demonstrably low for a given channel, or if the depth of pools is shallow due to fine sediment additions, or if the banks are degrading and the channel widening, then probable causes would be looked for that would account for the extreme conditions found.

Long Term Sites

Shipley Bay 105-43-10060 LTS 1. This site was typed a C3.3 based on the channel morphology and is atypical for the size of the watershed. A small clearcut occurs upstream of the site and future logging may be scheduled.

Salmon Bay 106-41-10150-2003 LTS 2. This site is in a natural unlogged setting within a C1 channel providing primarily spawning grounds for sockeye salmon, although high numbers of rearing coho salmon were found.

Salmon Bay 106-41-10150-2003 LTS 6. This site is in the main west fork downstream from the portion of the watershed proposed for logging and is also a C1 type channel providing excellent sockeye salmon spawning grounds.

Kadake Creek 109-41-10300 LTS 3. This site is in a very large watershed with logging active within the past 10 years. This C3 appeared natural in all channel attributes.

Kadake Creek 109-41-10300 LTS 7. This site is a C1 and is tributary to LTS 3. A small portion of the left bank has been logged but no degradation was noted. Old beaver sign was present but pink salmon were spawning throughout the site.

Nancy Creek (Hobart Bay) 110-33-10080 LTS 4. This site is a C1 located on private land in Hobart Bay. Logging has been extensive in the watershed and fine sand and silt was rated at 30 percent during the survey. Average data for the C1-channel is 17 percent for sand and silt combined, so there is concern that the fines not increase. Logging is about over in this watershed. One known source of fines is a road cut 2.5 miles upstream where the road development has caused down slope movement of sand and silt into the stream. Don Cornelius, Habitat Biologist for Alaska Department of Fish and Game requested that the condition be mitigated by Goldbelt Inc. who responded by placing straw and fencing on the slope. Photographs supplied by Goldbelt are on page 46 and show quite dramatically the large amount of retained fines caught behind fences put in place for less than a month.

To check on the survival of pink salmon eggs deposited in the gravel in a portion of the C1-channel immediately above the E1-channel, five hydraulic samples were taken on October 16, 1989. Distribution of salmon eggs over the riffle was good and survival was 95 percent. The proportion of fines pumped up by the sampler did not appear excessive at the time.

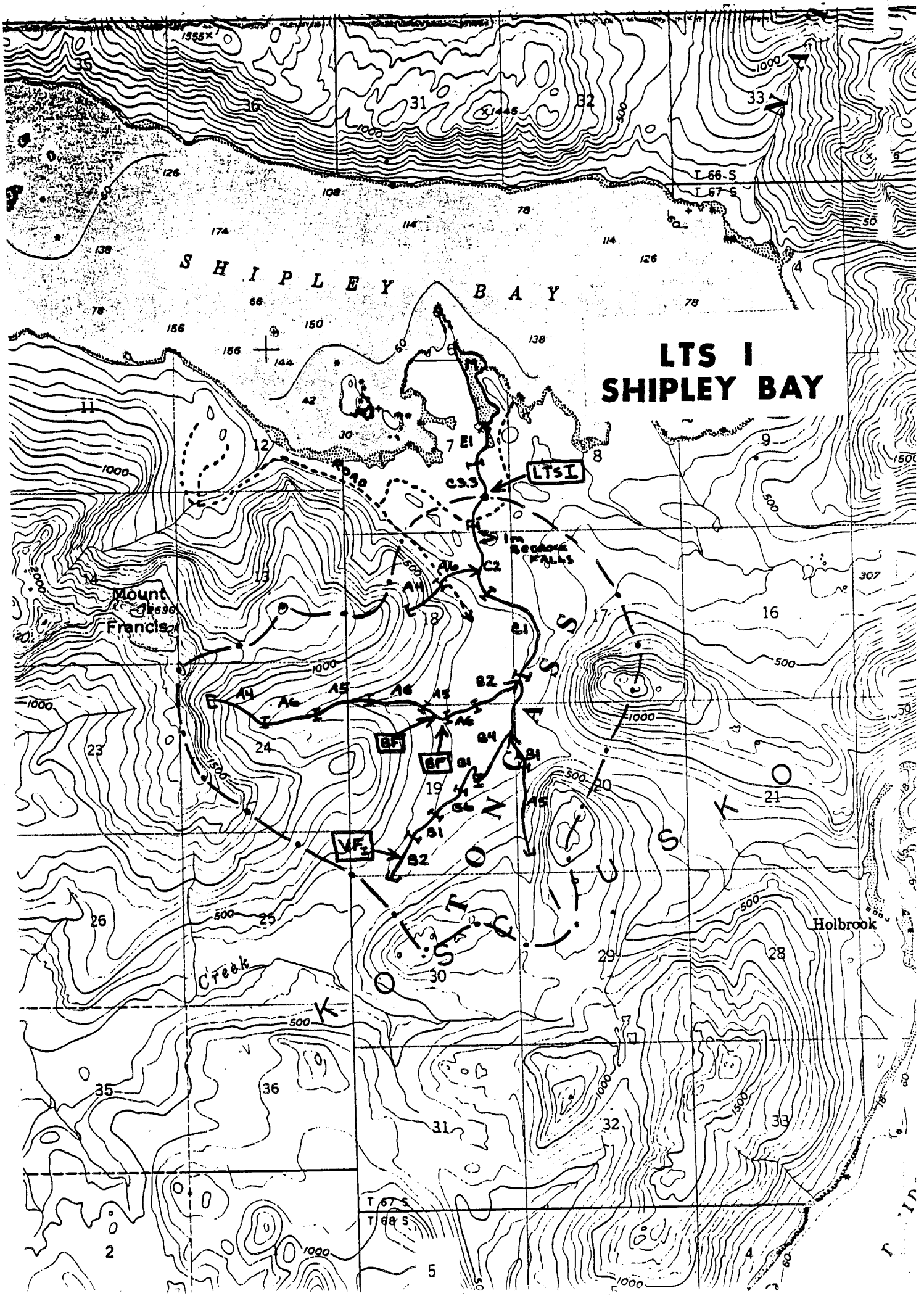
Security Bay (salt chuck) 109-45-10130 LTS 5. This site is a C1-channel segment situated in an upwelling spawning area used mainly by fall chum salmon. The stream is currently in a LUD-4 designation which means it could be logged. An extensive beaver dam is located below the site and appears to maintain and stabilize the water table throughout the stream. Chum and pink salmon were above the beaver dam.

Eliza Creek 109-30-10030 LTS 8. Logged in 1963, this large C3-channel site represents a watershed in an old logged condition. A study site needs to be selected in the C1-channel upstream of the east tributary to monitor large woody debris. Escapement since 1960 has trended upwards for pink salmon except for return of the brood years in the cold early 1970's. The catch of pink salmon also has trended upwards during the same period. Johnston Creek in Gambier Bay has shown a similar trend in escapement and catch. For comparison, another stream on southern Admiralty Island in Pybus Bay has shown a flat trend for catch and escapement during the period. Eliza Creek had the highest pink and chum escapement in 1989 since 1960.

Site Mapping Method

Study sites were first flown by helicopter to make sure that they were typical of the channel type and did not contain any inclusions. At the beginning of the site a tree on the bank was blazed and painted for future reference. Length of the site varied depending on the location and the extent of the large woody debris. Stable, well-anchored pieces of debris were blazed and painted with the blaze being put on the downstream side of the log when possible. When clumps were encountered only one piece in the clump was marked.

Mapping of debris location was done by first beginning at the downstream end of the site and going upstream, taking a compass bearing and distance from blaze to blaze. At each blaze the bankfull width was taken perpendicular to the compass bearing. Orientation of the woody debris was noted along with the type of debris. Unmarked pieces of debris were also noted on the map. The location of gravel bars, pools and riffle areas were then placed on the map. In most cases a black and white photo was taken at each compass bearing for future reference. These photos helped in mapping the location of gravel bars, riffle areas and debris.


LTS I
SHIPLEY BAY
SHIPLEY BAY
LTSI
Mount
Francis
Holbrook
Creek
T 67 S
T 68 S

CHANNEL TYPE VERIFICATION CARD

TE: 89/06/27 VCU: 541 SEG: N/A SITE: LTS1 AREA: 03 **********
D.: 054 MGT AREA: K04 SUB SEC: 1/4 QUAD: PSG-A5-SW *PRELIM CT: C1 *
REAM: SHIPLEY BAY SOUTH SIDE * FINAL CT: C3.3 *
F&G: 105-43-10060 **********
SIN AREA: 4.65 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 130 in.
TE ELEVATION: 50 ft. MAXIMUM ELEVATION: 1900 ft.
ROPHOTO (YR/FLT/ROLL/PHOTO): 71/11/572/122,123 GRADIENT: 0.5 %
STREAM PHOTO: 903-02 DOWNSTREAM PHOTO: 903-03 STREAM PATTERN: SINGLE
TER: 11.0 C. AIR: 16.0 C. TIME: 1100 hrs BANK CONTROL: MIXED
TE DISTURBED: N WEATHER: CLEAR BANKFULL WIDTH: 55.0 ft.
ACTIVE WIDTH: 18.0 ft.
ADJACENT LANDFORM & VEGETATION AVG.POOL DEPTH: 2.4 ft.
LEFT BANK *RIGHT BANK* # POOLS: 16
NDFORM: 53 53 POOLS: 60 % FISH OBSERVED: Y
NOPY: C6 C3 ASA: 20 % LIFESTAGE: J
ICISION:(meters) 1-2 1-2 ARA: 80 % IDENTITY:SS,ST,DV,CO

PLANT ASSOCIATION [DIST] * PLANT ASSOCIATION [DIST] TRAP RESULTS
LEFT BANK * *RIGHT BANK* (60 min. set)
* T#1 20SS,9ST,9DV,10CO
#1: 01-0-10%60-U-30%54-G-50%[40'] 1-0-25%60-U-40%51-G-40%[20'] T#2 16SS,11ST,8DV,14CO
#2: 355-20' 310-160 T#3 7SS,7ST,2DV,3CO
#3: 330-120' 80-20'
#4:
#5:

SUBSTRATE

BEDROCK: 20 %
SM BOULDER: 10 %
LG RUBBLE: 10 %
SM RUBBLE: 10 %
CRS GRAVEL: 20 %
FINE GRAVEL: 15 %
VFG/SAND: 10 %
ORGANIC/SILT: 5 %

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
BANK	20/0	180/12			
BANK	40/0	3/70	20/0	3/50	134/0

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
STANCE(ft):	0.0	0.5	21.0	28.0	32.0	43.0	46.0	54.0	55.0
NKFULL DEPTH(ft):	2.40	4.00	4.30	4.90	5.00	5.45	4.76	4.72	2.40
CTIVE DEPTH(ft):	*LEFT*				0.10	0.31			*RIGHT*
HALWAG LOCATION:				AW		THWG	AW		

L.O.D. TALLEY (DIAMETER)

ENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
10 ft			A1,E2		
)-25 ft		A3,C12	A1,B1,C6,E2	A1	
)-50 ft		C4	A1,B1,C10,E2	B1,C4,E3	
)-100 ft			B2,C11,E8	C6,E3	
00 ft					

AVERAGE KEY PIECE DIAMETER/LENGTH
20" 75'

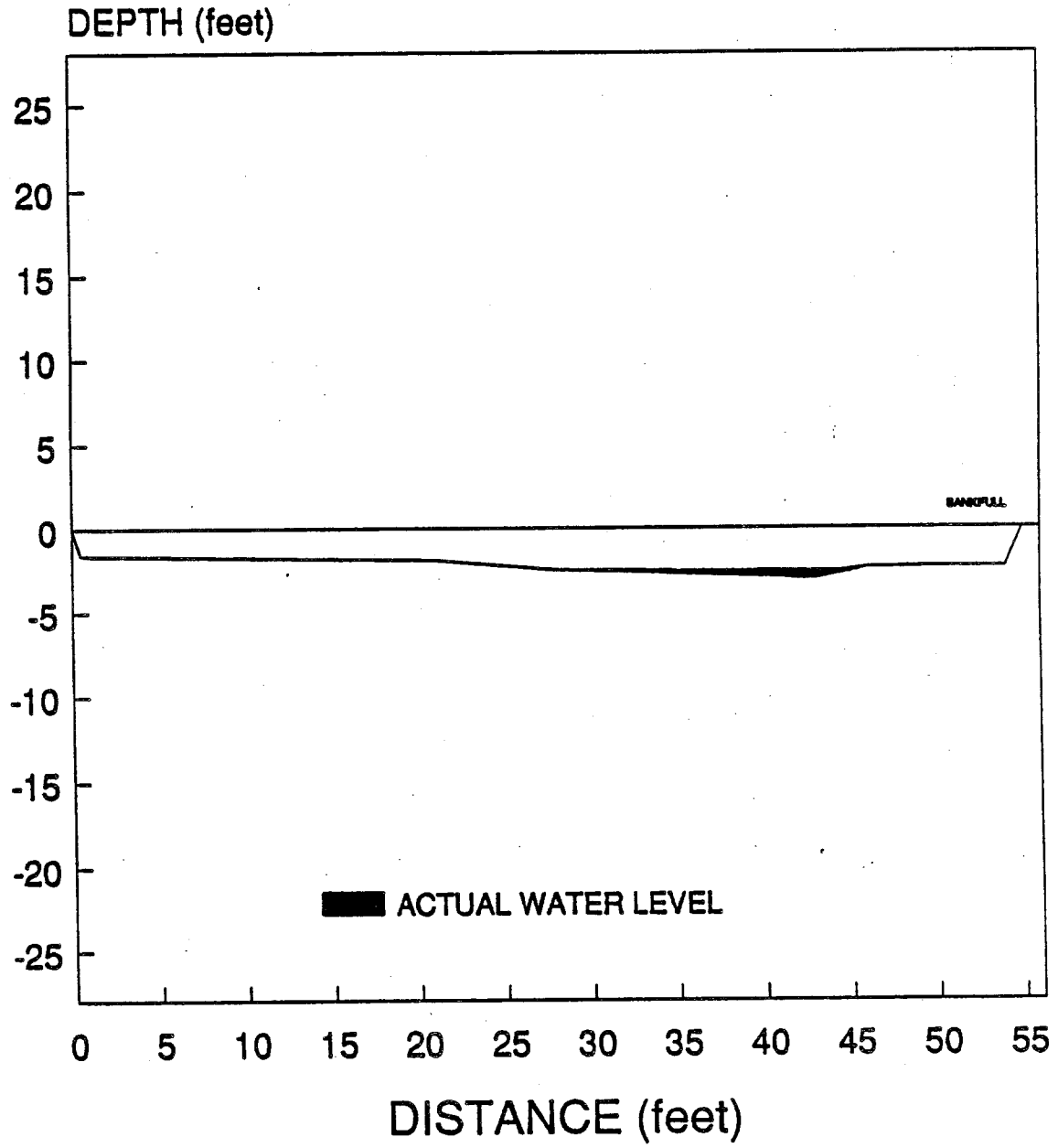
TRANSECT LENGTH: 667 ft.
CLUMP TALLEY:B1,C7,E6
DEBRIS POOLS:B2,C4,E1

OMMENTS: Even though the drainage area and bankfull width were less than the typical C3.3, we felt the channel type fit because of the high amount of bedrock.

LTS I SHIPLEY BAY

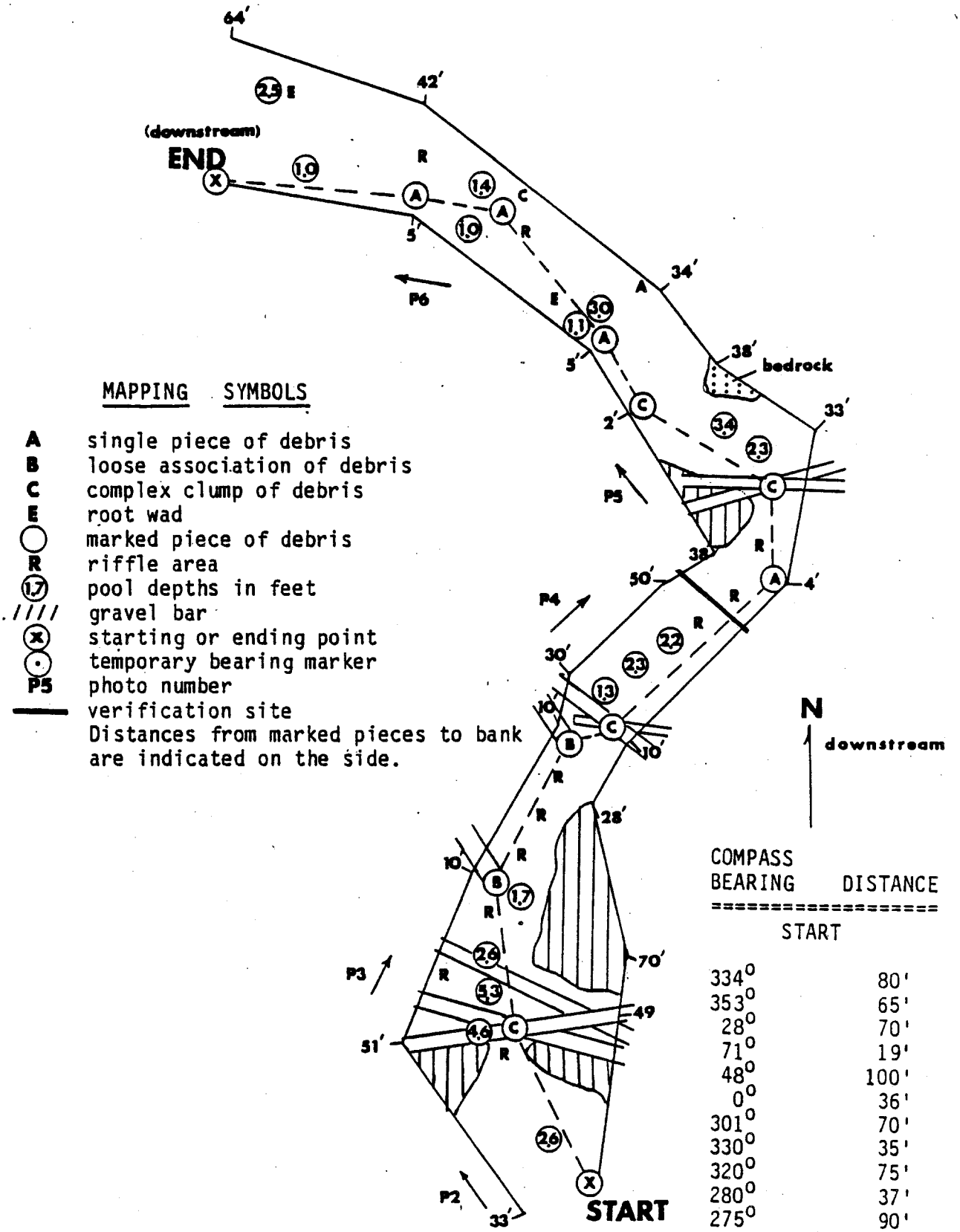
STREAM PROFILE

(LOOKING DOWNSTREAM)



JUNE 27,1989

LTS I
SHIPLEY BAY



LTS I SHIPLEY BAY

LTS I SHIPLEY BAY

PEAK ESCAPEMENT
105-43-06
SHIPLEY BAY

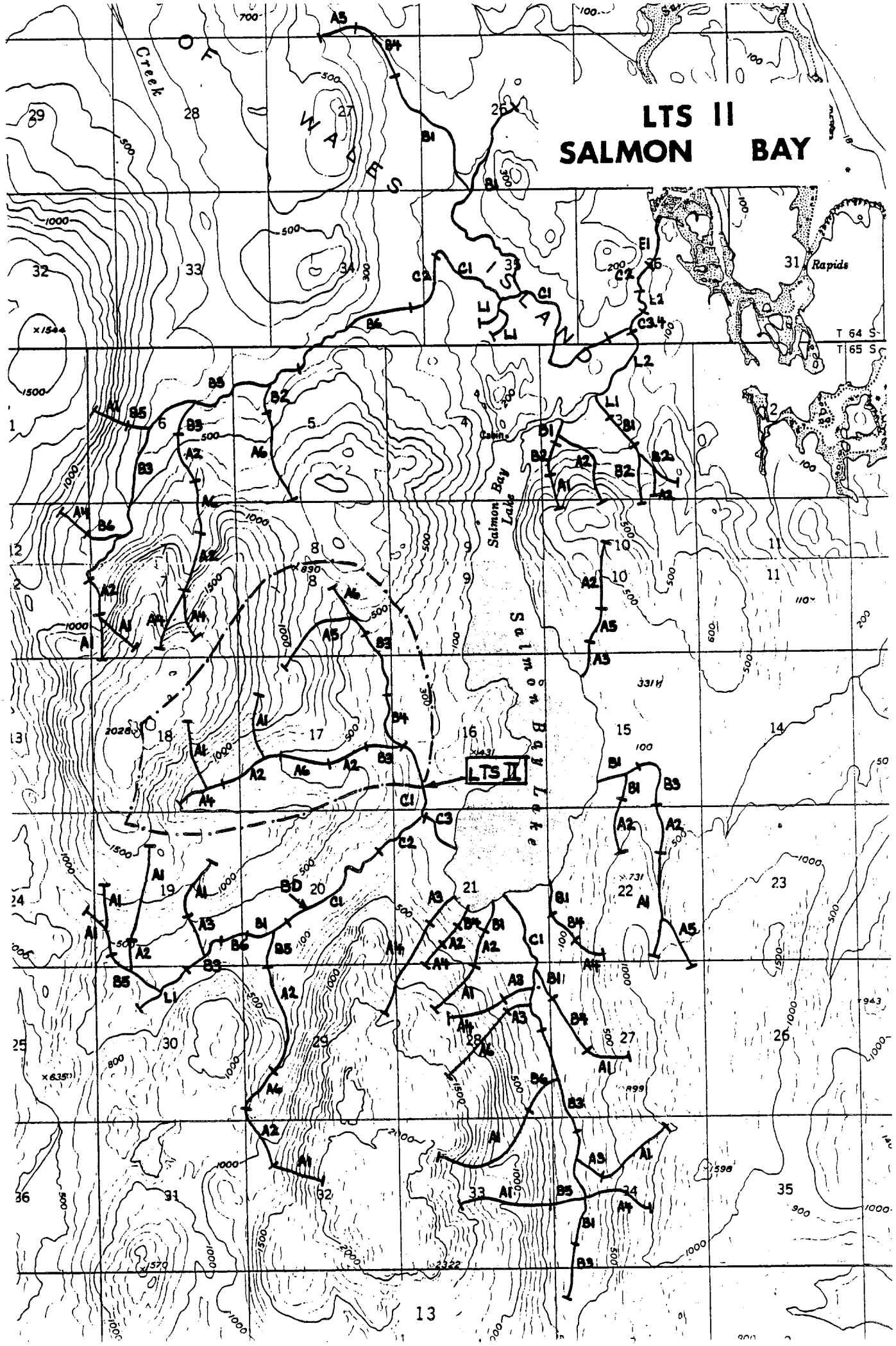
YEAR	CHUM	PINK	SOCKEYE	COHO	COMMENTS
1960	0	5500			
1961	0	3300			
1962	0	14700			
1963	0	30000			
1964	0	16700			
1965	0	19003			
1966	0	12000			
1967	0	7000			
1968	0	5003			
1969	0	1600			
1970	10	2500			
1971	0	10500			
1972	60	4000			
1973	0	1220			
1974	20	7000			
1975	0	500			
1976	0	4600			
1977	3	4800			
1978	0	6503			
1979	72	7280			
1980	0	7300			
1981	255	18022			
1982	22	13700			
1983	48	19460		9	
1984	4	10200		15	
1985	14	25850			
1986	2000	18000			
1987	0	7400			
1988	0	603			
1989	0	8800			
AVG.ALL YEARS	84	9768			
AVG.EVEN YEARS	141	8554			
AVG.ODD YEARS	26	10982			

105-43-06 SHIPLEY BAY

HABITAT ACCESSIBLE TO PINK SALMON

CHANNEL TYPE	LENGTH (ft.)	MEAN* ACTIVE WIDTH(ft)	ACTIVE AREA (sq.ft.)	MEAN* ASA %	ASA (sq.ft.)	ASA (sq.meters)
C3.3	1584	68.6	108662	17	18473	1716
C2	2244	54.1	121400	7	8498	789
C1	3380	37.2	125736	35	44008	4088
B2	2829	8.1	22915	26	5958	553
B1	3960	14.5	57420	31	17800	1654
B4	3300	17.3	57090	4	2284	212
B6	924	26.5	24486	10	2449	228
				TOTAL	99470	9240

* Means taken from channel type database


LTS II
SALMON BAY
Salmon Bay Lake
Rapids
T 64 S
T 65 S
LTS II

CHANNEL TYPE VERIFICATION CARD

DATE: 89/06/29 VCU: 534 SEG: N/A SITE: LTS2 AREA: 05
R.D.: 054 MGT AREA: K02 SUB SEC: 1/4 QUAD: PSG-A4-NW
STREAM: SALMON BAY LAKE WEST HEAD
ADF&G: 106-41-10150-2003-3012
BASIN AREA: 2.97 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 100 in.
SITE ELEVATION: 50 ft. MAXIMUM ELEVATION: 2028 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): 81/20/ /157-159 GRADIENT: 0.5 %
UPSTREAM PHOTO: 903-08 DOWNSTREAM PHOTO: 903-09 STREAM PATTERN: MULTIPLE
WATER: 16.0 C. AIR: 16.0 C. TIME: 1300 hrs BANK CONTROL: ALLUVIUM
SITE DISTURBED: N WEATHER: CLEAR BANKFULL WIDTH: 35.7 ft.
ACTIVE WIDTH: 19.7 ft.
AVG.POOL DEPTH: 2.2 ft.
POOLS: 9
POOLS: 60 % FISH OBSERVED: Y
ASA: 30 % LIFESTAGE: J
ARA: 70 % IDENTITY:SS

****
*PRELIM CT: C1 *
* FINAL CT: C1 *
****

ADJACENT LANDFORM & VEGETATION

	LEFT BANK	*RIGHT BANK*
LANDFORM:	53	51
CANOPY:	C3	C5
INCISION:(meters)	1-2	1-2

PLANT ASSOCIATION [DIST]

	LEFT BANK	*	*RIGHT BANK*
PA#1:	351-45'	*	340-40'
PA#2:	330-155'	*	130-160'
PA#3:		*	
PA#4:		*	
PA#5:		*	

TRAP RESULTS (60 min. set)
T#1 15SS,5ST,1DV
T#2 11SS,3ST,1DV
T#3 9SS,8ST,1DV

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
R.BANK	60/0	140/7			
L.BANK	200/0				

SUBSTRATE

BEDROCK:	0 %
SM BOULDER:	0 %
LG RUBBLE:	10 %
SM RUBBLE:	20 %
CRS GRAVEL:	20 %
FINE GRAVEL:	40 %
VFG/SAND:	10 %
ORGANIC/SILT:	0 %

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0	0.9	12.0	19.0	26.0	27.5	31.7	35.0	35.7
BANKFULL DEPTH(ft):	2.90	4.32	5.23	5.36	5.85	5.94	5.20	4.86	2.74
ACTIVE DEPTH(ft):	*LEFT*			0.20	0.69	0.78			*RIGHT*
THALWAG LOCATION:			AW			THWG	AW		

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft			E1		E1
10-25 ft		B1,C7,E1	A1,C10,E2		
25-50 ft		B1	A1,C3		
50-100 ft			A2,C5,E5	C4,E3	
>100 ft					A1,C1,E2

AVERAGE KEY PIECE DIAMETER/LENGTH
24" 50'

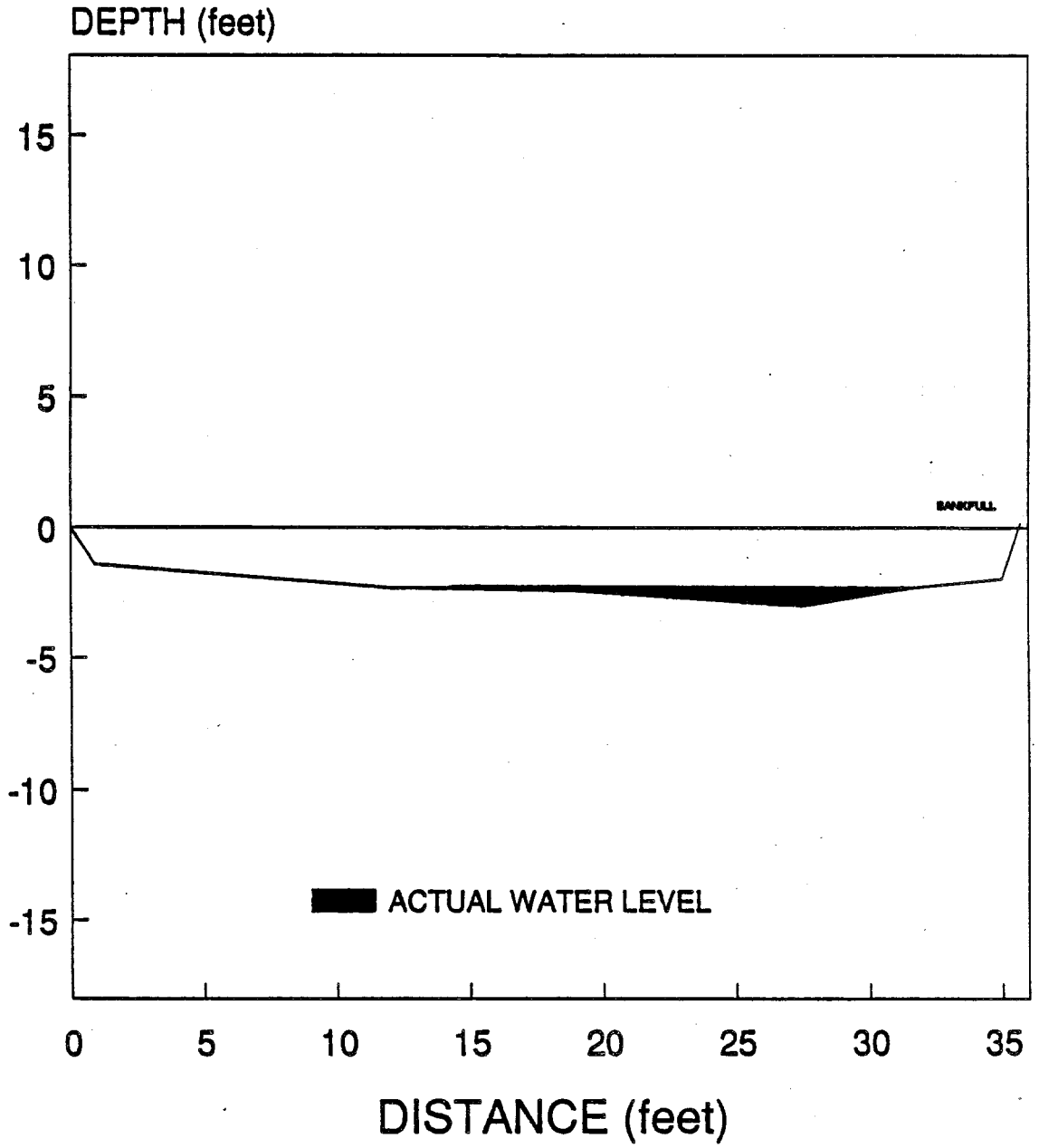
TRANSECT LENGTH: 353 ft.
CLUMP TALLEY:B1,C4,E4
DEBRIS POOLS:A1,C5,E1

COMMENTS: Site is above main-stem floodplain. Geometry at 1st blaze mark. Tons of LOD below site. Water level extremely low.

LTS II SALMON BAY

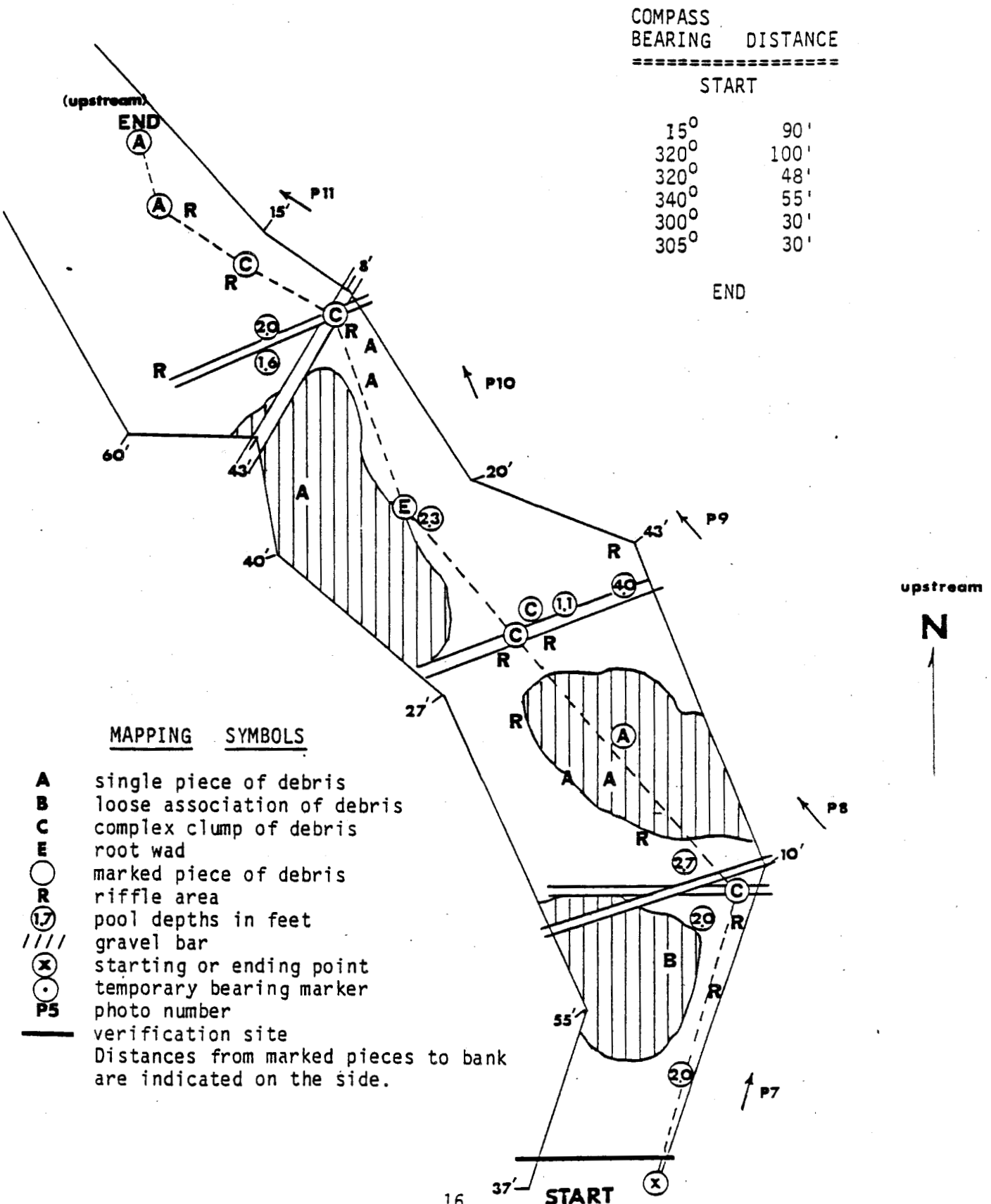
STREAM PROFILE

(LOOKING DOWNSTREAM)



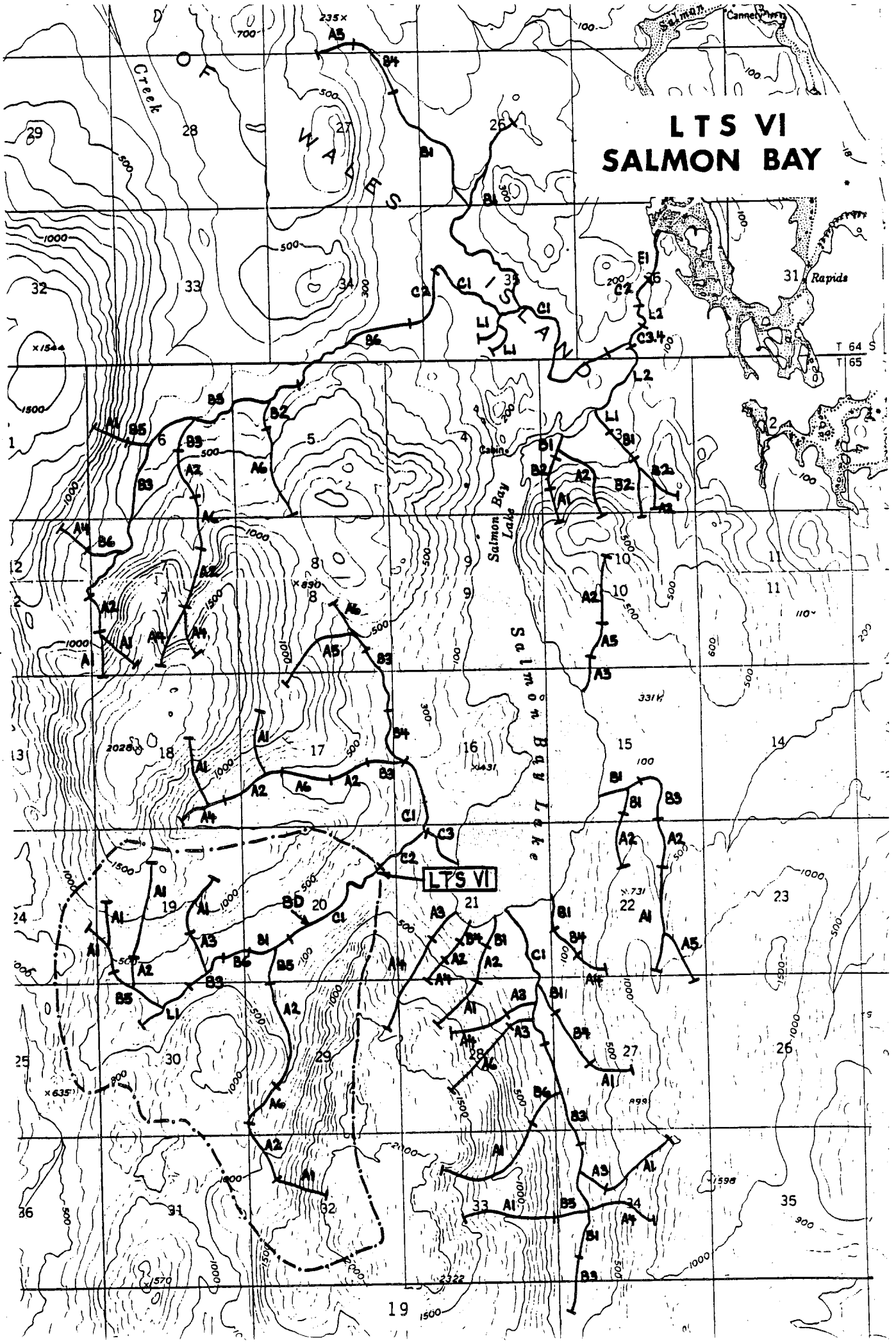
JUNE 29, 1989

LTS II
SALMON BAY



LTS II SALMON BAY

LTS II SALMON BAY


LTS VI
SALMON BAY
Creek
Salmon Bay Lake
Salmon Bay Lake
Rapids
Cabin
LTS VI
T 64 S
T 65

CHANNEL TYPE VERIFICATION CARD

DATE: 89/09/07 VCU: 534 SEG: N/A SITE: LTS6 AREA: 05 **********
R.D.: 054 MGT AREA: K02 SUB SEC: 1/4 QUAD: PSG-A4-NW *PRELIM CT: C1 *
STREAM: SALMON BAY LAKE WEST HEAD * FINAL CT: C1 *
ADF&G: 106-41-10150-2003 **********
BASIN AREA: 4.81 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 110 in.
SITE ELEVATION: 90 ft. MAXIMUM ELEVATION: 2322 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): 81/20/ /157-159 GRADIENT: 0.5 %
UPSTREAM PHOTO: 903-21 DOWNSTREAM PHOTO: 903-22 STREAM PATTERN: SINGLE
WATER: 13.0 C. AIR: 19.0 C. TIME: hrs BANK CONTROL: ALLUVIUM
SITE DISTURBED: N WEATHER: CLEAR BANKFULL WIDTH: 61.1 ft.
ACTIVE WIDTH: 49.7 ft.
AVG.POOL DEPTH: 1.2 ft.
POOLS: 16
POOLS: 15 % FISH OBSERVED: Y
ASA: 50 % LIFESTAGE: JA
ARA: 15 % IDENTITY:SS,RS,PS,DV

ADJACENT LANDFORM & VEGETATION

	LEFT BANK	*RIGHT BANK*
LANDFORM:	53	51
CANOPY:	C5	C5
INCISION:(meters)	<1	<1

	PLANT ASSOCIATION [DIST] *LEFT BANK*	PLANT ASSOCIATION [DIST] *RIGHT BANK*
PA#1:	350-20'	350-40'
PA#2:	140-180'	140-160'
PA#3:		
PA#4:		
PA#5:		

TRAP RESULTS (60 min. set)
T#1 0
T#2 0
T#3 0

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
R.BANK	40/0	50/10	110/54		
L.BANK	30/0	20/55	20/-55	130/-18	

SUBSTRATE

BEDROCK:	5 %
SM BOULDER:	0 %
LG RUBBLE:	0 %
SM RUBBLE:	0 %
CRS GRAVEL:	45 %
FINE GRAVEL:	40 %
VFG/SAND:	10 %
ORGANIC/SILT:	0 %

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0		11.5	25.1	31.8	37.1	49.1	60.4	61.1
BANKFULL DEPTH(ft):	1.7		4.00	5.02	5.16	4.74	4.05	3.70	1.80
ACTIVE DEPTH(ft):	*LEFT*			1.32	1.50	1.04	0.44		*RIGHT*
THALWAG LOCATION:			AW		THWG			AW	

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft			B1,C1		
10-25 ft	A1,B1,C7	A4,B3,C6,E1	A3,B1,C3		B1
25-50 ft		B1,C1	A3,B4,C4,E2		
50-100 ft			A1,C3	C1	A1
>100 ft					

AVERAGE KEY PIECE DIAMETER/LENGTH
18" 50'

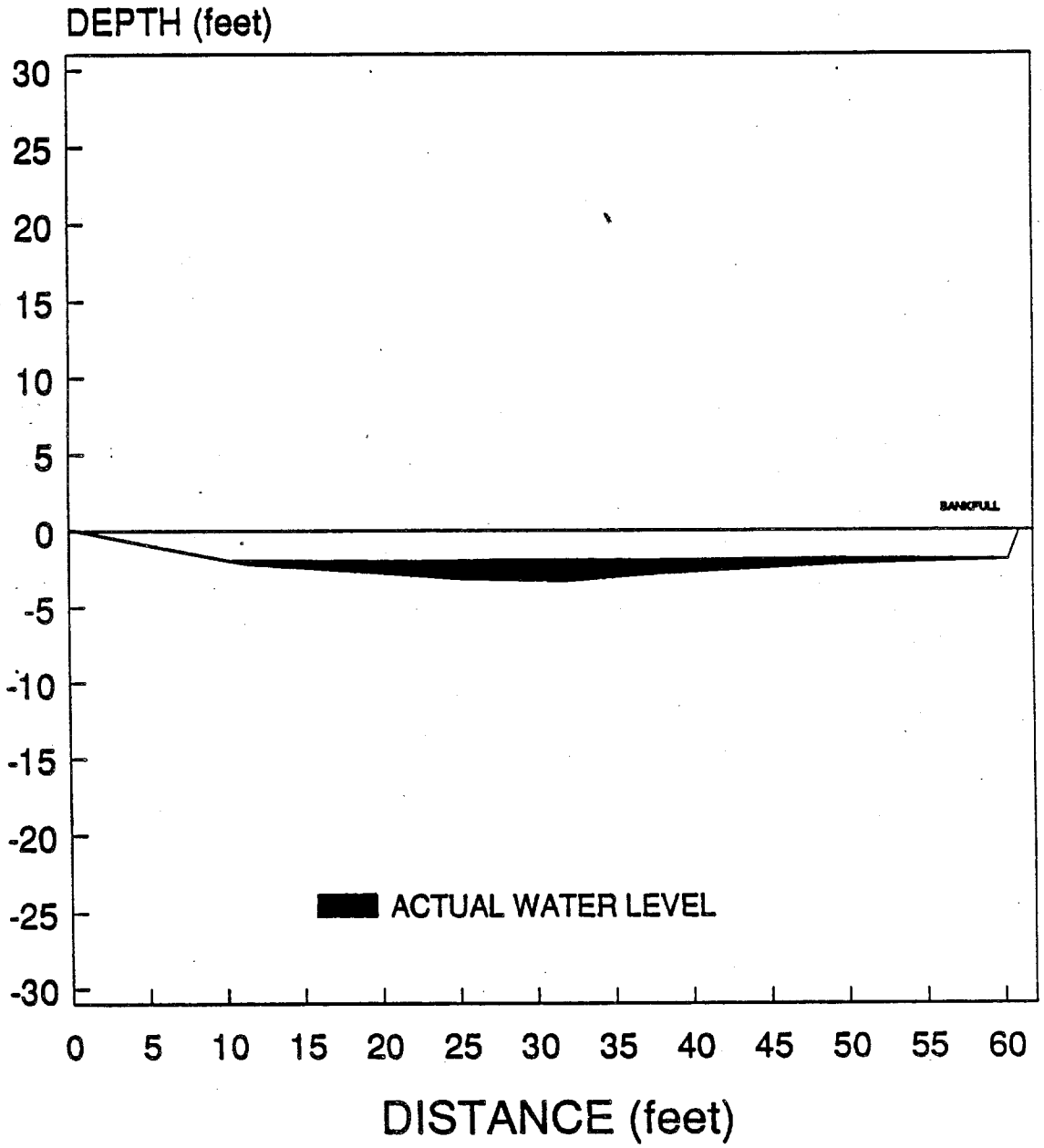
TRANSECT LENGTH: 390 ft.
CLUMP TALLEY:B4,C6
DEBRIS POOLS:A3,B2,C1

COMMENTS: Saw juvenile coho, probably feeding on sockeye eggs. Lots of glides. Left sideslope heads back down towards an old stream bed. 211 adult sockeye, 2 dead. Saw several adult pinks.

LTS VI SALMON BAY

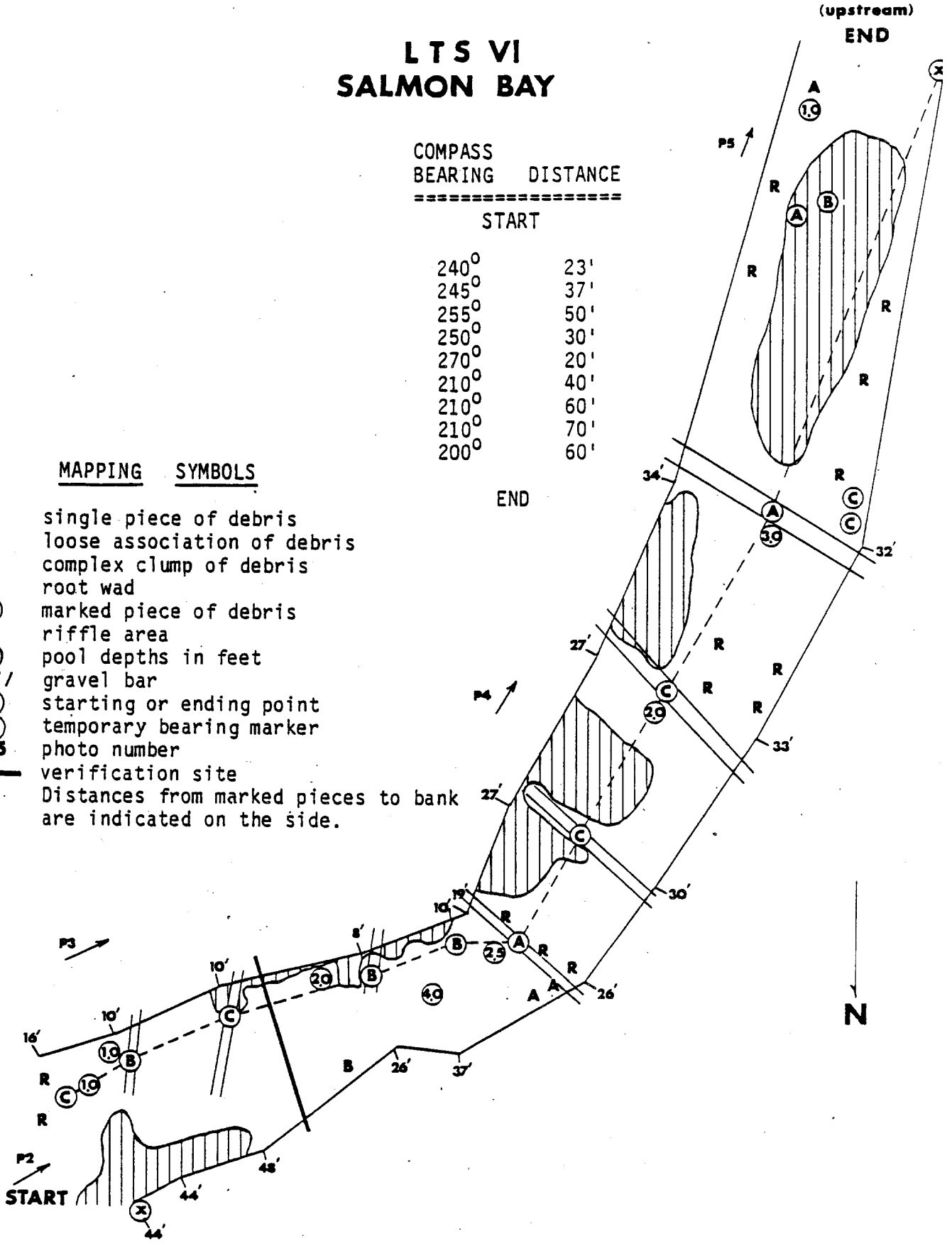
STREAM PROFILE

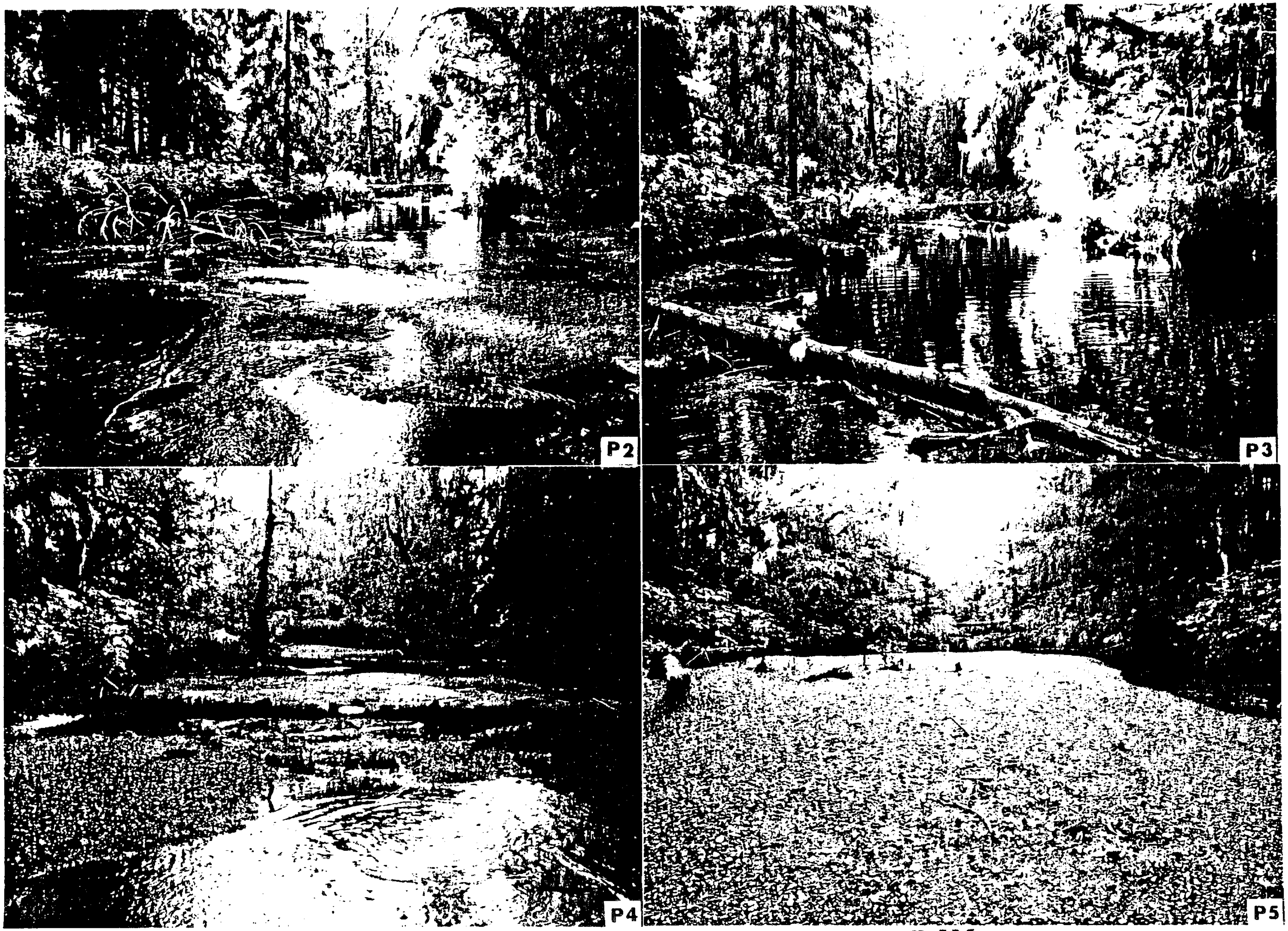
(LOOKING DOWNSTREAM)



SEPTEMBER 7, 1989

LTS VI
SALMON BAY





ITE VI SALMON BAY

PEAK ESCAPEMENT
106-41-015
SALMON BAY LAKE(W.HEAD)

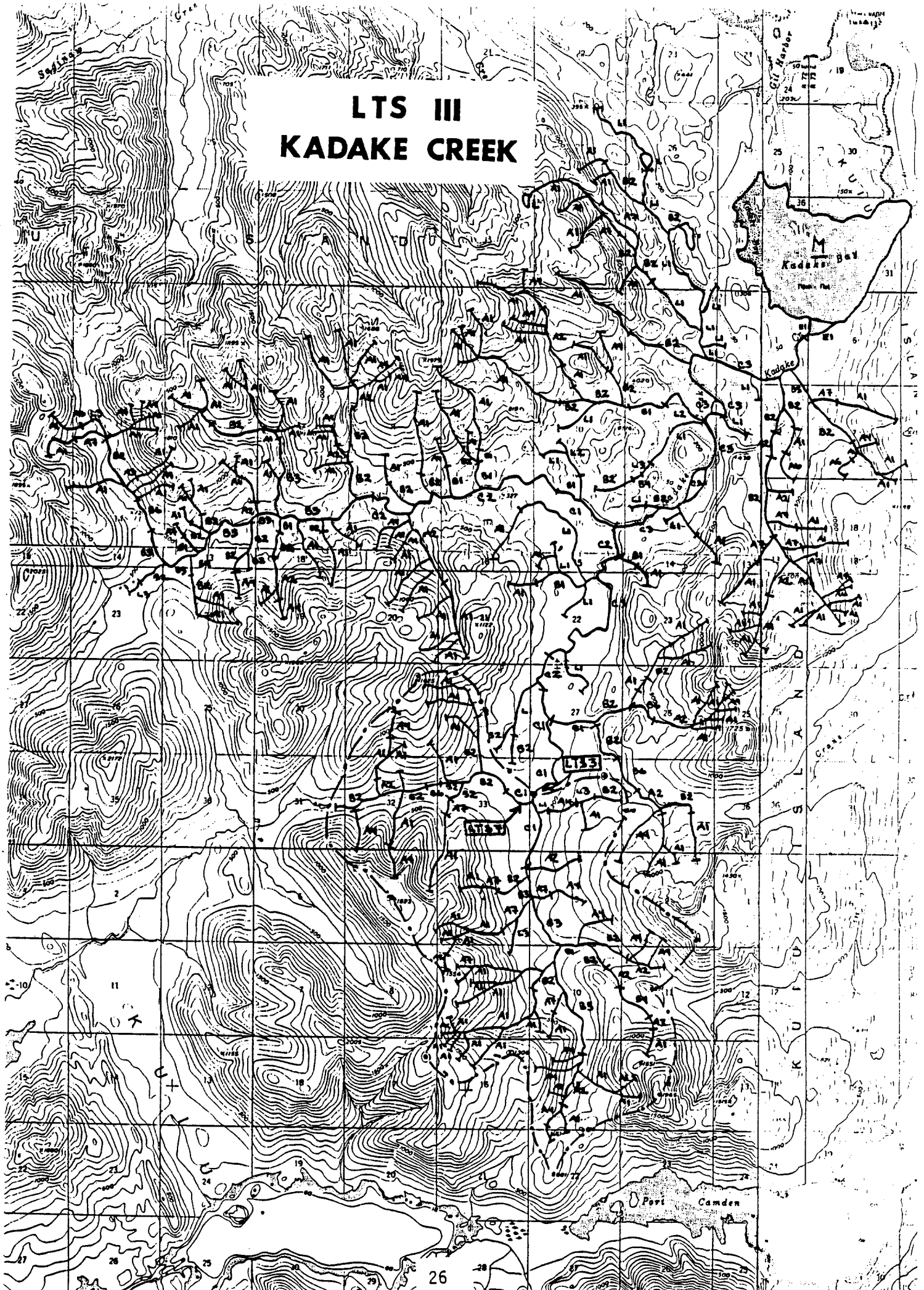
YEAR	CHUM	PINK	SOCKEYE	COHO	COMMENTS
1960		No Survey	No Survey		
1961		No Survey	No Survey		
1962		No Survey	No Survey		
1963		No Survey	No Survey		
1964		No Survey	No Survey		
1965		No Survey	No Survey		
1966		No Survey	No Survey		
1967		No Survey	No Survey		
1968		No Survey	No Survey		
1969		No Survey	No Survey		
1970		No Survey	No Survey		
1971		No Survey	No Survey		
1972		No Survey	No Survey		
1973		No Survey	No Survey		
1974		No Survey	No Survey		
1975		No Survey	No Survey		
1976		No Survey	No Survey		
1977		0	4316		
1978		0	815		
1979		No Survey	No Survey		
1980		0	1540		
1981		0	0		
1982		0	300		
1983		No Survey	No Survey		
1984		74	1923		
1985		417	2335		
1986		179	1430		
1987		19	3215		
1988		0	3177		
1989		20	2672		
AVG.ALL YEARS		24	724		
AVG.EVEN YEARS		17	612		
AVG.ODD YEARS		30	836		

106-41-15 SALMON BAY LAKE

HABITAT ACCESSIBLE TO SOCKEYE SALMON

CHANNEL TYPE	LENGTH (ft.)	MEAN* ACTIVE WIDTH(ft)	ACTIVE AREA (sq.ft.)	MEAN* ASA %	ASA (sq.ft.)	ASA (sq.meters)
C1	4446	37.2	165391	35	57887	5378
C3	1779	69.6	123818	32	38622	3588
C2	1779	54.1	96244	7	6737	626
				TOTAL	104246	9592

* Means taken from channel type database


LTS III
KADAKE CREEK
Kadake Bay
Kadake
Port Camden
LTS3
LTS2

CHANNEL TYPE VERIFICATION CARD

DATE: 89/06/30 VCU: 421 SEG: N/A SITE: LTS3 AREA: 02 **********
R.D.: 021 MGT AREA: S04 SUB SEC: 1/4 QUAD: PAX-C1-NE *PRELIM CT: C1 *
STREAM: KADAKE CREEK * FINAL CT: C3 *
ADF&G: 109-42-10300 **********
BASIN AREA: 9.80 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 110 in.
SITE ELEVATION: 150 ft. MAXIMUM ELEVATION: 1965 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): 79/13/779/43,44 GRADIENT: 0.5 %
UPSTREAM PHOTO: 903-14 DOWNSTREAM PHOTO: 903-15 STREAM PATTERN: MULTIPLE
WATER: 13.0 C. AIR: 20.5 C. TIME: 1300 hrs BANK CONTROL: ALLUVIUM
SITE DISTURBED: Y WEATHER: CLEAR BANKFULL WIDTH: 73.2 ft.
ACTIVE WIDTH: 13.5 ft.
AVG.POOL DEPTH: 3.9 ft.
POOLS: 12
POOLS: 30 % FISH OBSERVED: Y
ASA: 60 % LIFESTAGE: J
ARA: 40 % IDENTITY:SS,ST,CT,DV

ADJACENT LANDFORM & VEGETATION

	LEFT BANK	*RIGHT BANK*
LANDFORM:	53	80
CANOPY:	C5	C3
INCISION:(meters)	<1	<1

	PLANT ASSOCIATION [DIST] *LEFT BANK*	PLANT ASSOCIATION [DIST] *RIGHT BANK*
PA#1:	351-20'	351-25'
PA#2:	130-180'	330-175'
PA#3:		
PA#4:		
PA#5:		

TRAP RESULTS (60 min. set)
T#1 33SS,24ST,43DV,17CO
T#2 13SS,15ST,32DV,7CO
T#3 13SS,12ST,11DV,9CO

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
R.BANK	20/0	3/55	177/0		
L.BANK	6/90	194/0			

SUBSTRATE

BEDROCK:	0 %
SM BOULDER:	0 %
LG RUBBLE:	0 %
SM RUBBLE:	25 %
CRS GRAVEL:	25 %
FINE GRAVEL:	50 %
VFG/SAND:	0 %
ORGANIC/SILT:	0 %

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0	1.8	17.5	35.1	45.6	48.6	59.5	72.8	73.1
BANKFULL DEPTH(ft):	3.70	4.58	2.78	5.32	5.90	5.56	4.80	4.60	3.40
ACTIVE DEPTH(ft):	*LEFT*				0.48				*RIGHT*
THALWAG LOCATION:				AW	THWG	AW			

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft			E1		
10-25 ft	A2,C5	A4,C5	A3,C2,E1		
25-50 ft		A1,C2	A1,C6,E2	C2	C2
50-100 ft			A1,C7,E6	C4,E4	
>100 ft			C1,E1	A1,C2	C1

AVERAGE KEY PIECE DIAMETER/LENGTH
36" 100'

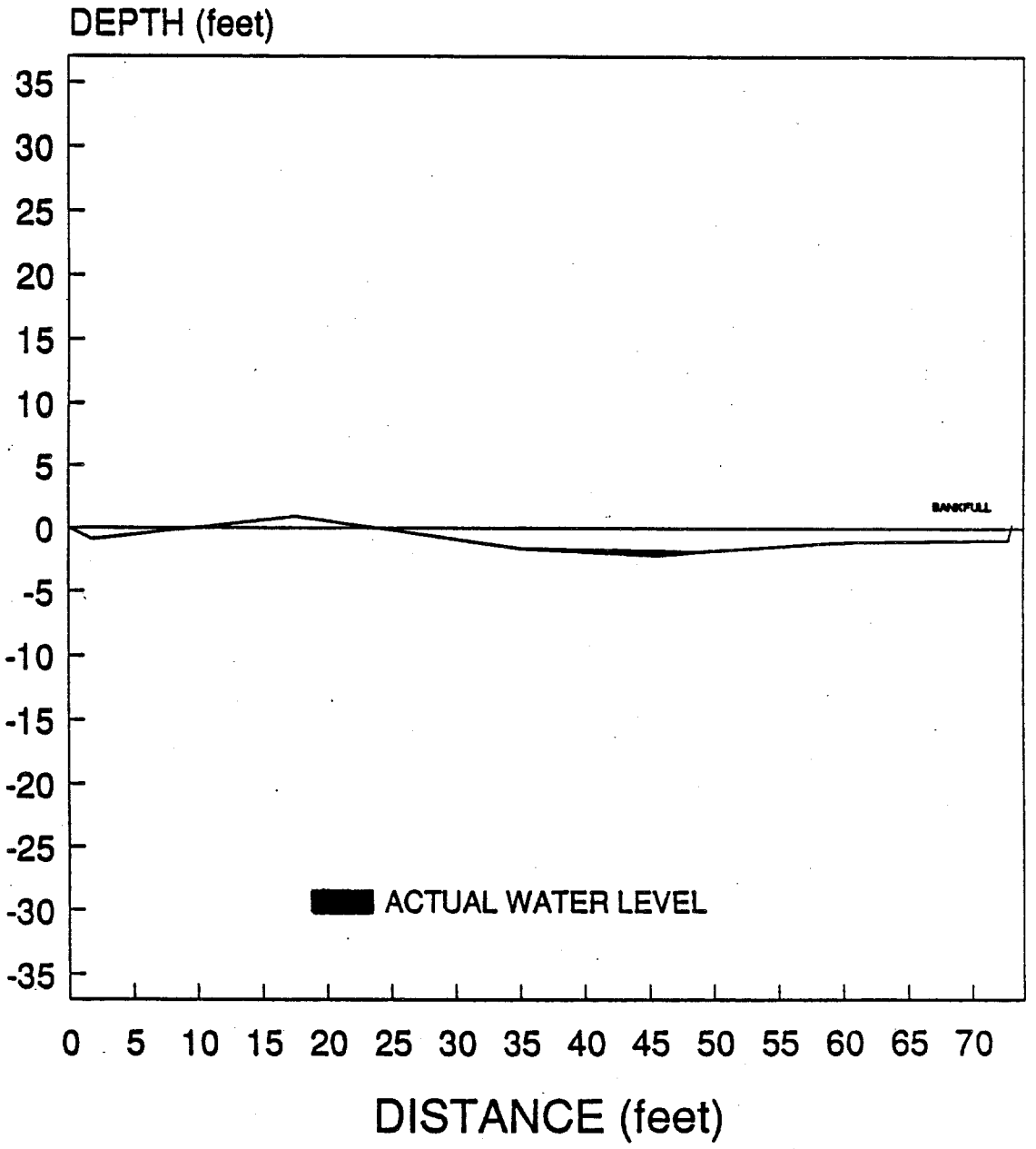
TRANSECT LENGTH: 612 ft.
CLUMP TALLEY:C7,E6
DEBRIS POOLS:A1,C4,E5

COMMENTS: Redtail hawk adult and probable nest with juvenile. Lots of Sambucus present on right bank. Adult cutthroat and dolly varden present. Vegetation was taken in upper end of transect, in old growth. Hydrology was down in upper edge of clearcut.

LTS III KADAKE CREEK

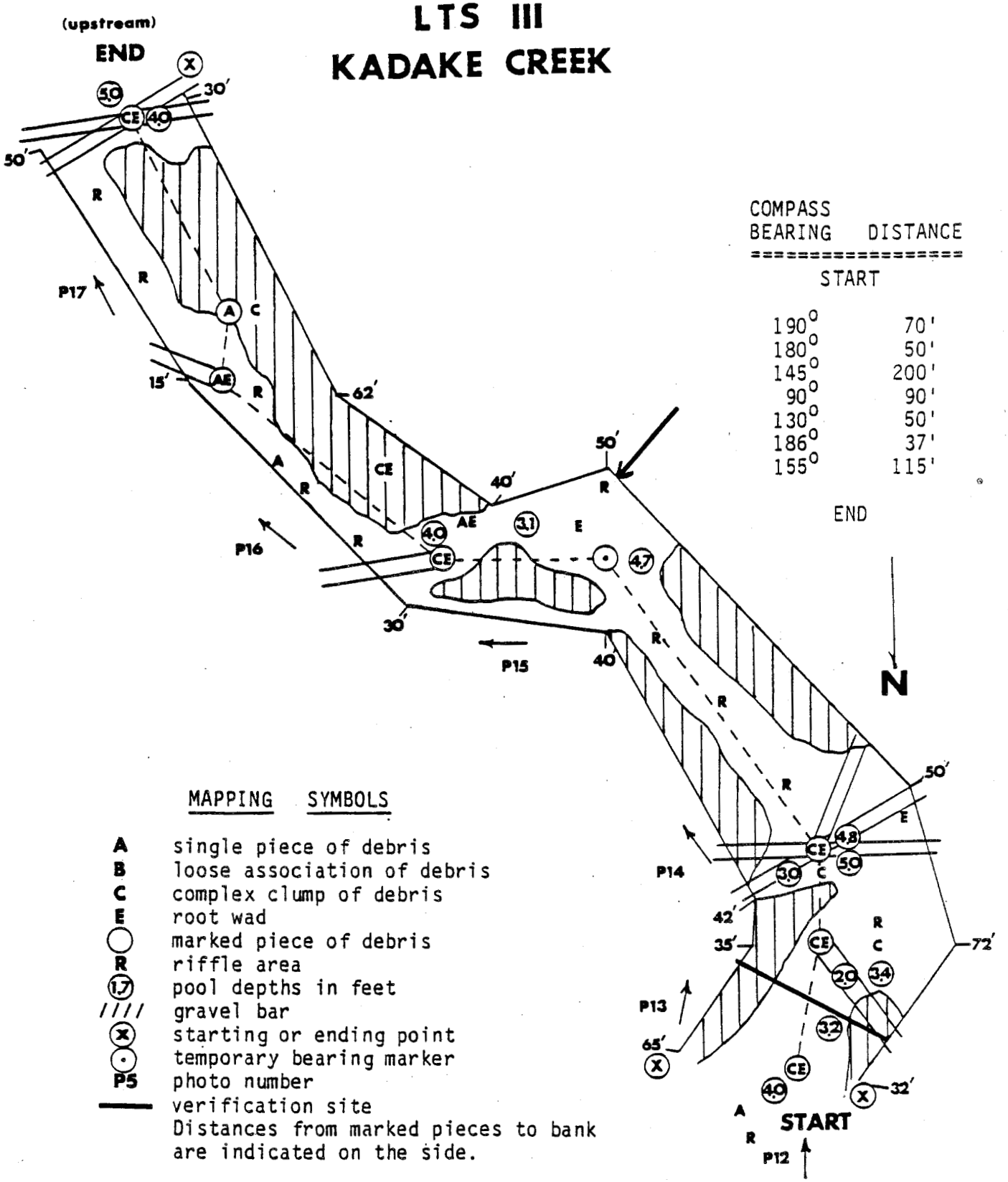
STREAM PROFILE

(LOOKING DOWNSTREAM)



JUNE 30, 1989

LTS III
KADAKE CREEK

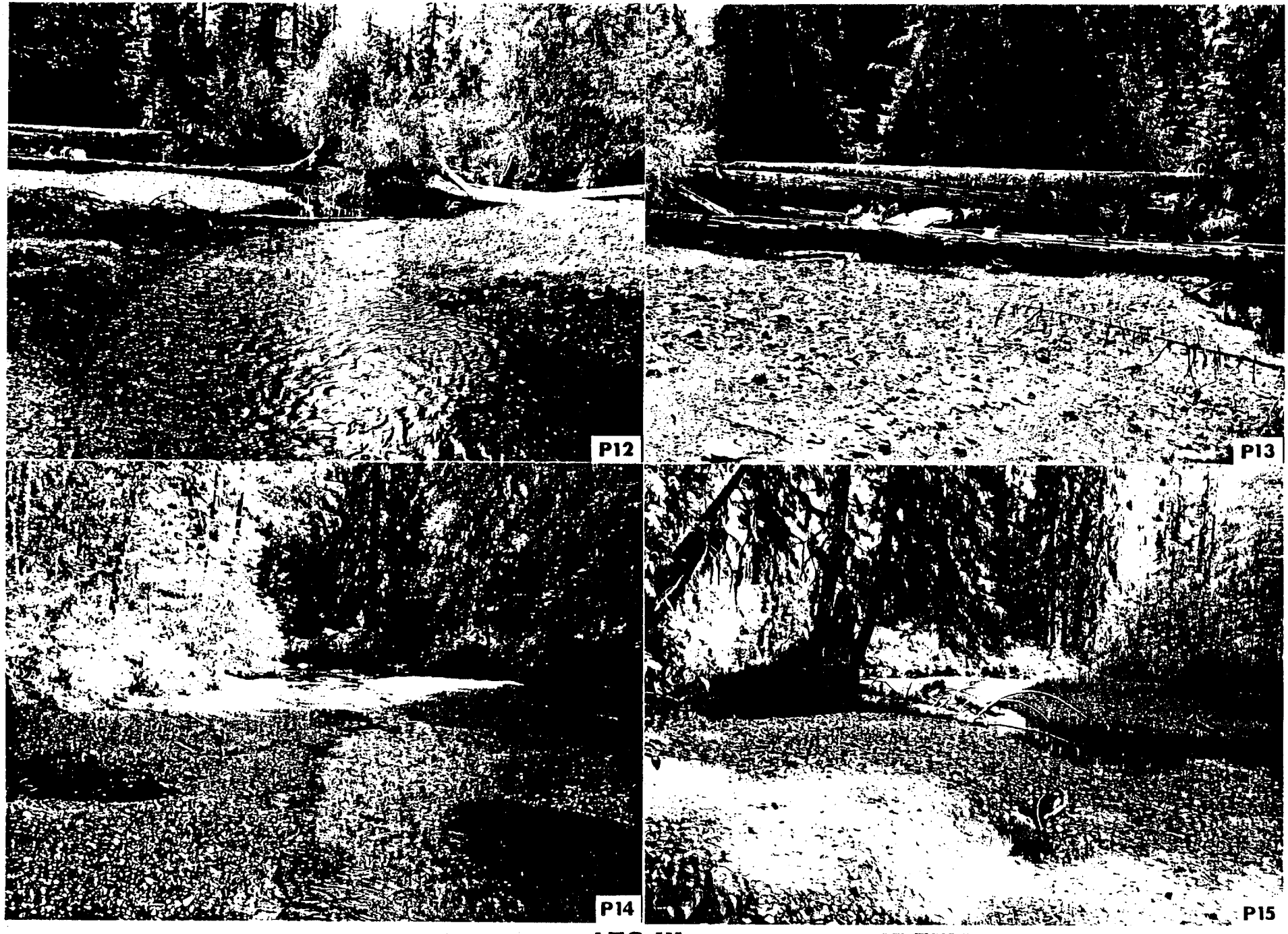


COMPASS BEARING	DISTANCE
START	
190°	70'
180°	50'
145°	200'
90°	90'
130°	50'
186°	37'
155°	115'
END	

MAPPING SYMBOLS

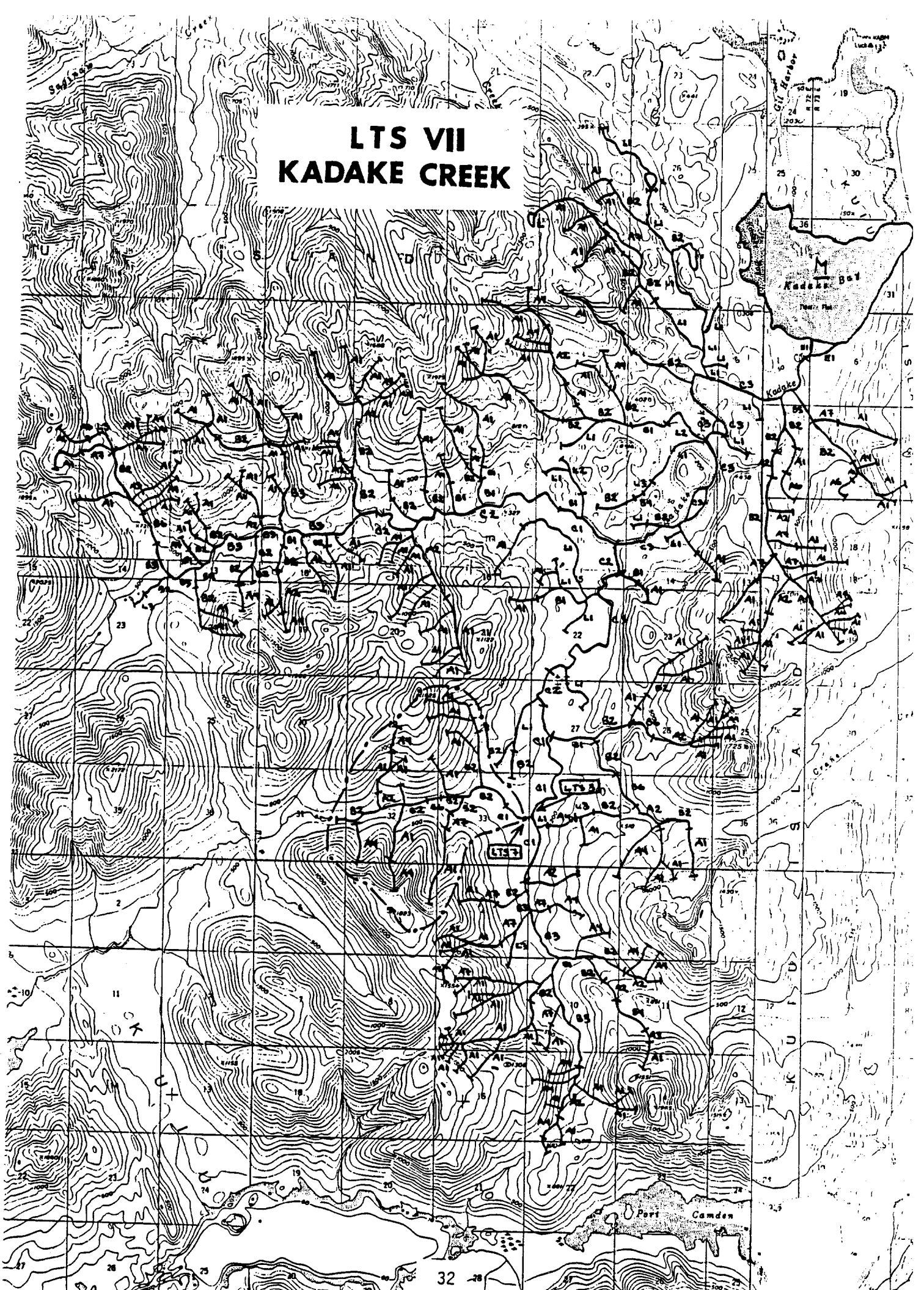
A	single piece of debris
B	loose association of debris
C	complex clump of debris
E	root wad
◯	marked piece of debris
R	riffle area
(1.7)	pool depths in feet
////	gravel bar
(X)	starting or ending point
(·)	temporary bearing marker
P5	photo number
———	verification site

Distances from marked pieces to bank are indicated on the side.



LTS III KADAKE CREEK

LTS III KADAKE CREEK


LTS VII
KADAKE CREEK
Kadake
Port Camden

CHANNEL TYPE VERIFICATION - CARD

DATE: 89/09/08 VCU: 421 SEG: N/A SITE: LTS7 AREA: 02
R.D.: 021 MGT AREA: S04 SUB SEC: 1/4 QUAD: PAX-C1-NE
STREAM: KADAKE CREEK
ADF&G: 109-42-10300-2018
BASIN AREA: 3.00 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 110 in.
SITE ELEVATION: 150 ft. MAXIMUM ELEVATION: 1823 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): 79/13/779/43,44
UPSTREAM PHOTO: 903-23 DOWNSTREAM PHOTO: 903-24
WATER: 10.5 C. AIR: 15.0 C. TIME: 1100 hrs
SITE DISTURBED: Y WEATHER: CLEAR

****
*PRELIM CT: B1 *
* FINAL CT: C1 *
****

GRADIENT: 1.0 %
STREAM PATTERN: SINGLE
BANK CONTROL: ALLUVIUM
BANKFULL WIDTH: 49.9 ft.
ACTIVE WIDTH: 18.4 ft.
AVG.POOL DEPTH: 2.5 ft.
POOLS: 11
POOLS: 10 % FISH OBSERVED: Y
ASA: 25 % LIFESTAGE: JA
ARA: 15 % IDENTITY:SS,PS,DV,ST

	ADJACENT LANDFORM & VEGETATION *LEFT BANK*	*RIGHT BANK*
LANDFORM:	53	53
CANOPY:	C3	C3
INCISION:(meters)	1-2	<1

	PLANT ASSOCIATION [DIST] *LEFT BANK*	PLANT ASSOCIATION [DIST] *RIGHT BANK*
PA#1:	350-15'	350-20'
PA#2:	330-50'	330-180'
PA#3:	320-130'	
PA#4:	80-10'	
PA#5:		

TRAP RESULTS (60 min. set)
T#1 23SS,9ST,4DV,1CO
T#2 12SS,6ST,11DV,2CO
T#3 6SS,1CO

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
R.BANK	200/0				
L.BANK	200/0				

SUBSTRATE

BEDROCK:	0 %
SM BOULDER:	0 %
LG RUBBLE:	0 %
SM RUBBLE:	5 %
CRS GRAVEL:	40 %
FINE GRAVEL:	40 %
VFG/SAND:	10 %
ORGANIC/SILT:	5 %

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0	0.4	10.0	18.8	20.0	30.0	40.0		49.9
BANKFULL DEPTH(ft):	3.60	8.50	7.50	6.80	6.60	6.80	7.75		3.70
ACTIVE DEPTH(ft):	*LEFT*	1.65	0.80			0.35	1.35		*RIGHT*
THALWAG LOCATION:		AW	THWG	AW					

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft					E1
10-25 ft	A1,C8	A2,C3	A5,C4,E2	C2	
25-50 ft		C2	A2,C1		C2
50-100 ft			C1		
>100 ft					

AVERAGE KEY PIECE DIAMETER/LENGTH
12" 25'

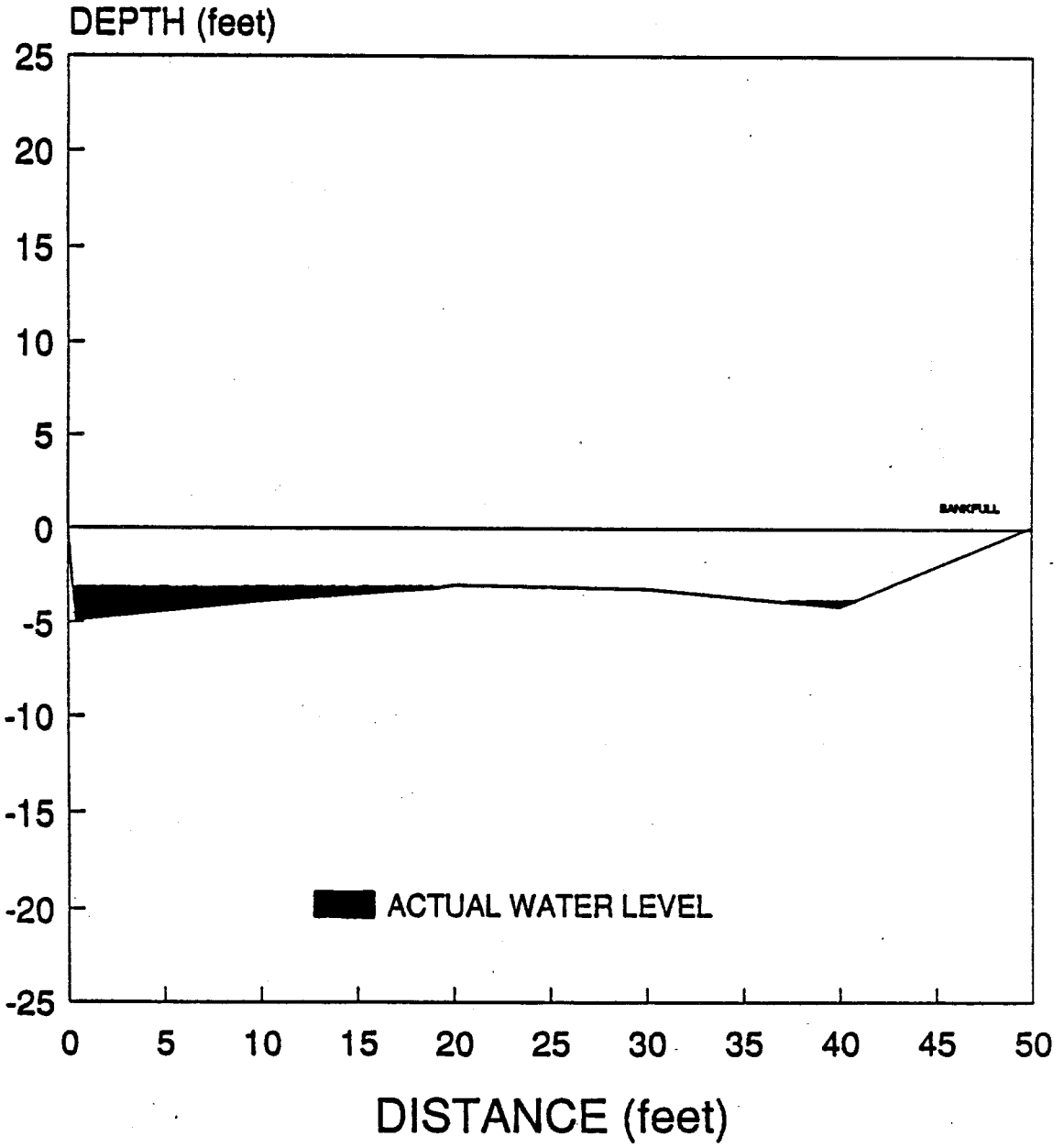
TRANSECT LENGTH: 638 ft.
CLUMP TALLEY:C4,E1
DEBRIS POOLS:A1,C4,E1

COMMENTS: Right sideslope is flat with small (<3' wide) depressions of old overflow channels. Left edge of site is on edge of old clearcut.

LTS VII KADAKE CREEK

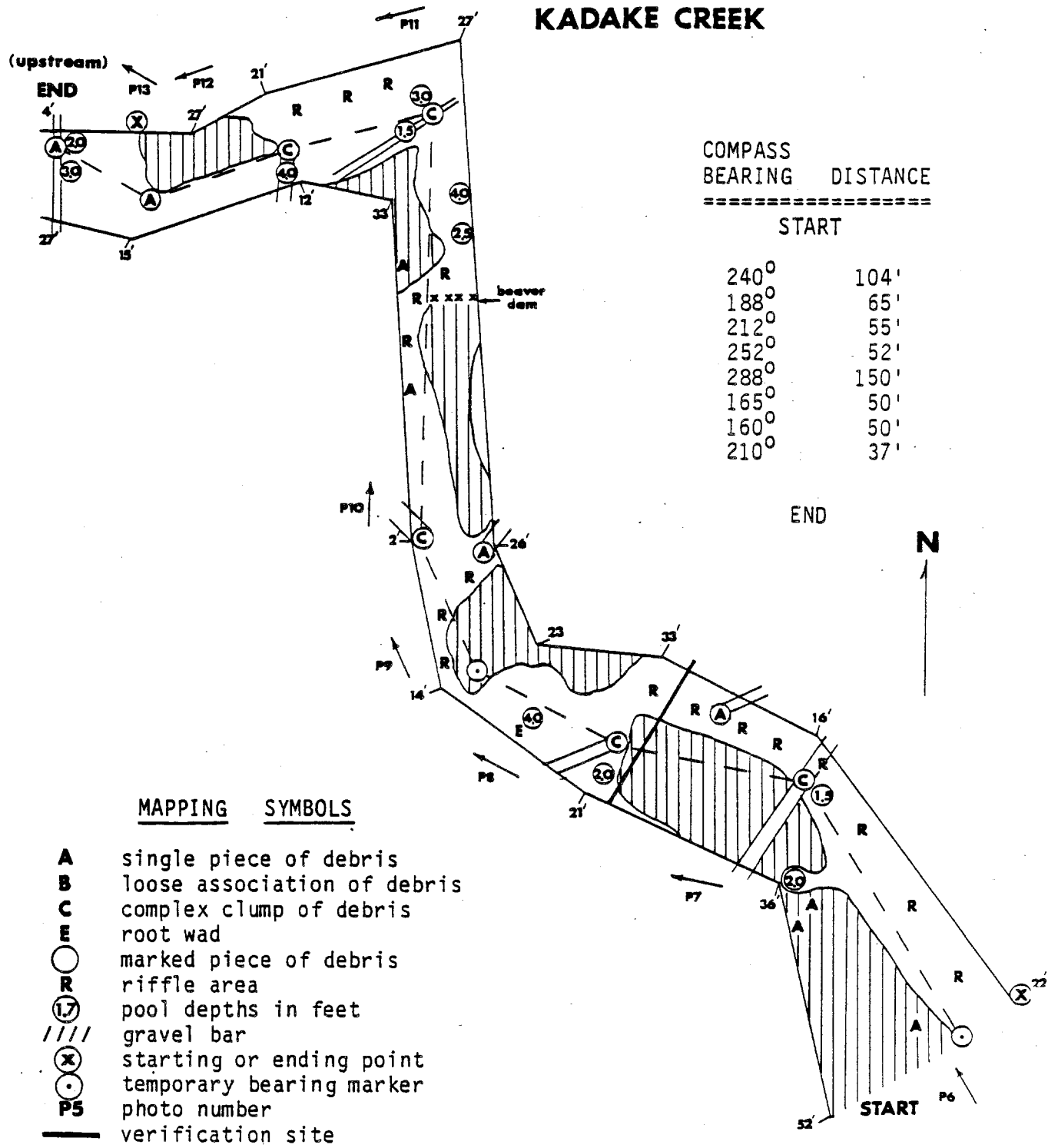
STREAM PROFILE

(LOOKING DOWNSTREAM)



SEPTEMBER 8, 1989

LTS VII
KADAKE CREEK

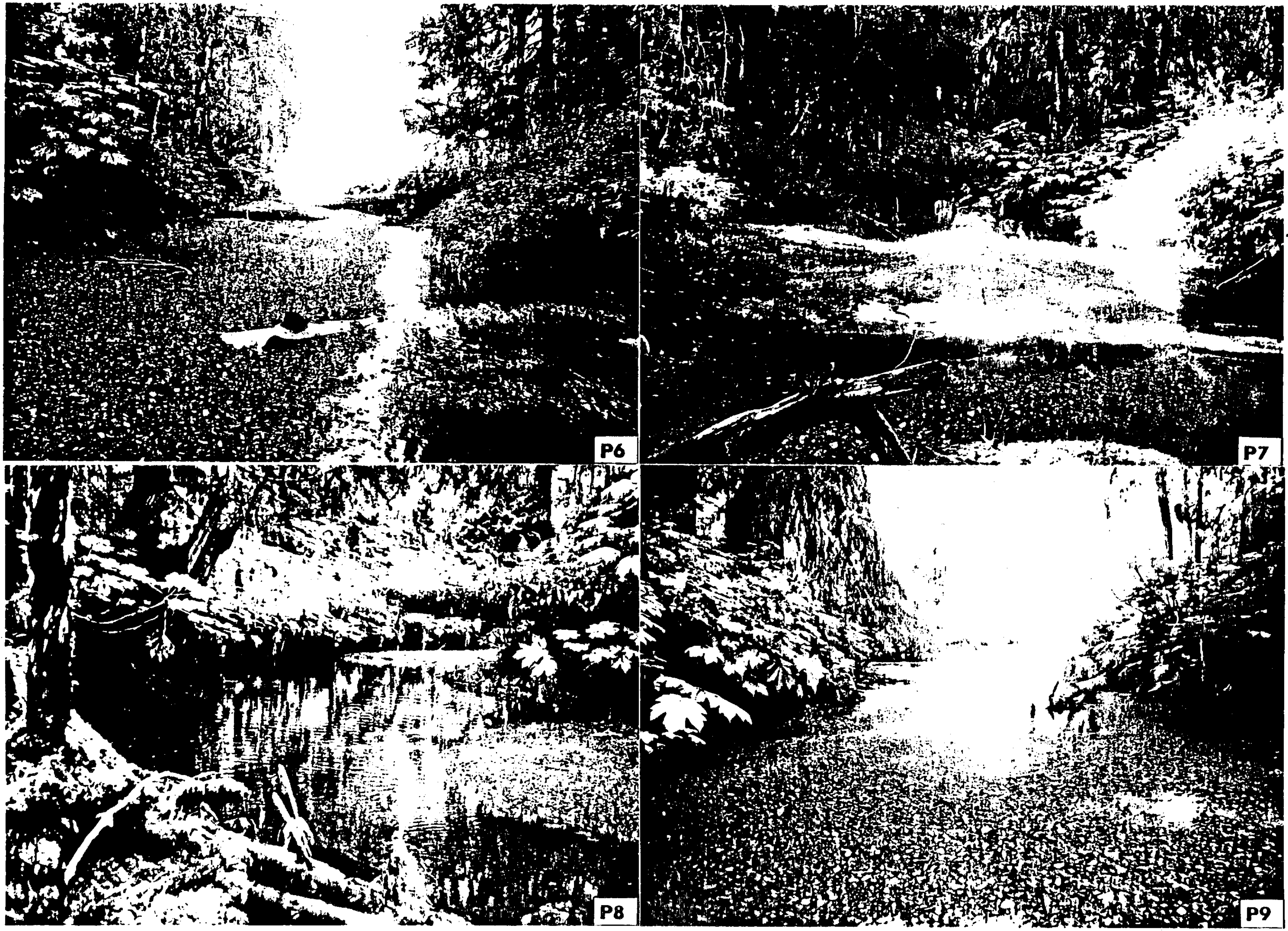


COMPASS BEARING	DISTANCE
START	
240°	104'
188°	65'
212°	55'
252°	52'
288°	150'
165°	50'
160°	50'
210°	37'
END	

MAPPING SYMBOLS

A	single piece of debris
B	loose association of debris
C	complex clump of debris
E	root wad
◯	marked piece of debris
R	riffle area
(1.7)	pool depths in feet
////	gravel bar
(X)	starting or ending point
(·)	temporary bearing marker
P5	photo number
———	verification site

Distances from marked pieces to bank are indicated on the side.



LTS VII KADAKE CREEK

PLATE VII KADAKE CREEK

PEAK ESCAPEMENT
109-42-30
KADAKE CREEK

YEAR	CHUM	PINK	SOCKEYE	COHO	COMMENTS
1960	0	6			
1961	0	6000			
1962	100	8000			
1963	300	8200			
1964	0	42000			
1965	0	4300			
1966	0	18000			
1967	0	6			
1968	150	8000			
1969	1000	0			
1970	500	7000			
1971	0	24500			
1972	0	14800			
1973	0	24000			
1974	1600	690			
1975	0	600			
1976	0	850			
1977	200	18200			
1978	0	13400			
1979	0	41300			
1980	5	25500			
1981	0	8700			
1982	0	69400			
1983	0	28000			
1984	400	19200			
1985	0	80000			
1986	600	55000			
1987	20	60000			
1988	0	16000			
1989	70	86000		5	
AVG.ALL YEARS	165	22922			
AVG.EVEN YEARS	224	19856			
AVG.ODD YEARS	106	25987			

109-42-30 KADAKE CREEK

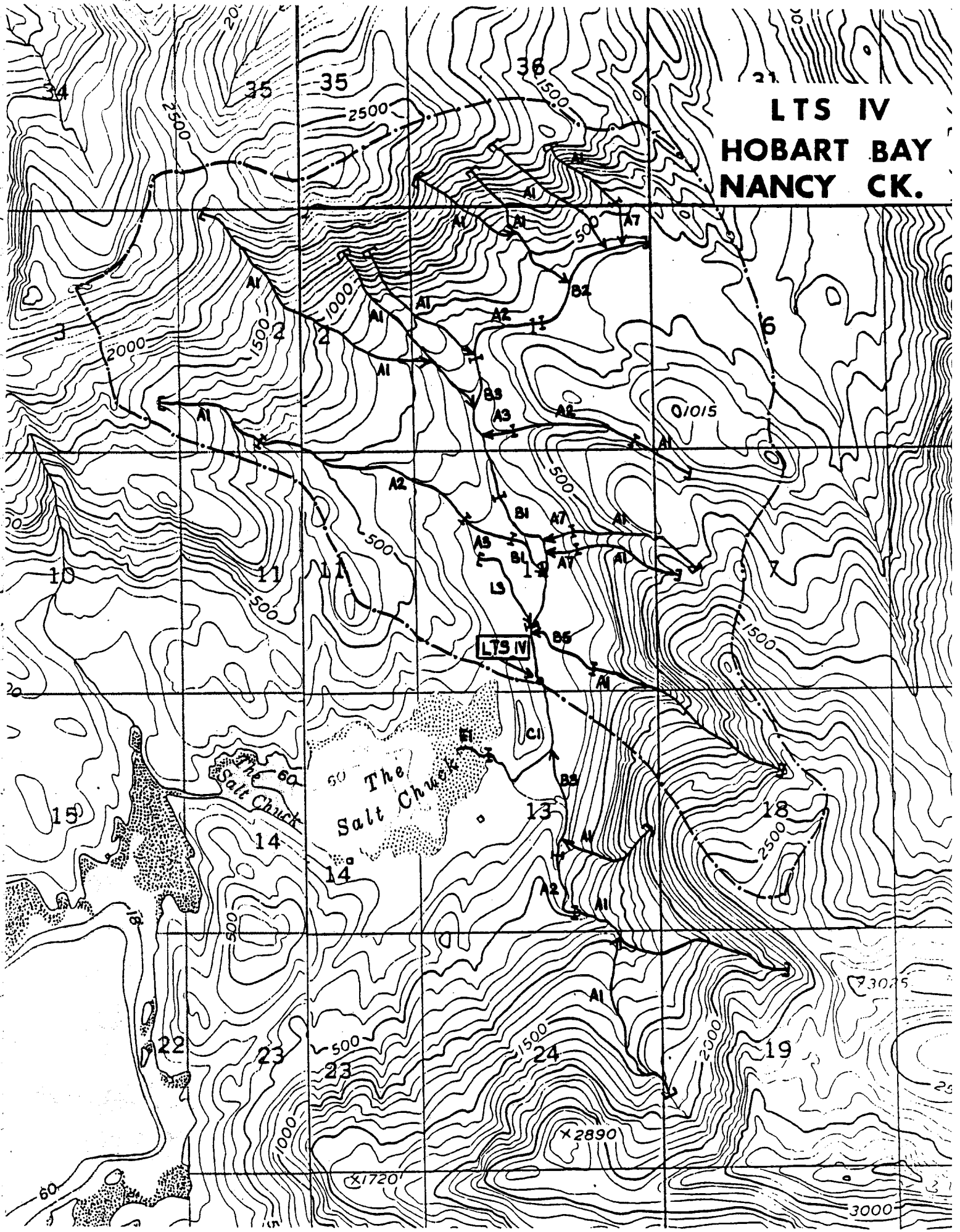
HABITAT ACCESSIBLE TO PINK SALMON

CHANNEL TYPE	LENGTH (ft.)	MEAN* ACTIVE WIDTH(ft)	ACTIVE AREA (sq.ft.)	MEAN* ASA %	ASA (sq.ft.)	ASA (sq.meters)
C3	22440	69.6	1561824	32	499784	46430
C3**	22440	38.0	852720	10	85272	7922
C2	15840	54.1	856944	7	59986	5573
B1	9240	14.5	133980	31	41534	3858
B2***	42240	8.1	342144	26	88957	8264
B3	5280	24.9	131472	23	30239	2809
B6	2640	26.5	69960	10	6996	650
				TOTAL	812768	75506

* Means taken from channel type database.

** The upper 4.25 miles of C3 channel was found to contain a higher percentage of sand and pool area. The active width was found to be considerably lower than the average for C3 channels. For this reason ASA was lowered to 10% and active width lowered to 38.0 feet.

*** We did not include any channels found above "L" series channels since it is doubtfull that pink salmon would pass through them though coho often do.
We also excluded any B2 channels which were not tributaries to mainstem "C" channels since their use by pinks is questionable. In total 15,175 meters of B2 channel were excluded.


LTS IV
HOBART BAY
NANCY CK.
LTS IV
The Salt Chuck
The Salt Chuck
×2890
×1720
3000
2500
2000
1500
1000
500

CHANNEL TYPE VERIFICATION CARD

DATE: 89/08/08 VCU: 075 SEG: N/A SITE: LTS4 AREA: 03 **********
R.D.: 031 MGT AREA: C13 SUB SEC: 1/4 QUAD: SUM-B4-NW *PRELIM CT: B1 *
STREAM: NANCY CREEK, HOBART BAY * FINAL CT: C1 *
ADF&G: 110-33-10080 **********
BASIN AREA: 5.20 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 100 in.
SITE ELEVATION: 50 ft. MAXIMUM ELEVATION: 2900 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): 77/35/1376/21 GRADIENT: 0.5 %
UPSTREAM PHOTO: 903-16 DOWNSTREAM PHOTO: 903-17 STREAM PATTERN: SINGLE
WATER: 11.0 C. AIR: 15.5 C. TIME: 1200 hrs BANK CONTROL: ALLUVIUM
SITE DISTURBED: Y WEATHER: RAIN BANKFULL WIDTH: 37.5 ft.
ACTIVE WIDTH: 36.2 ft.
AVG.POOL DEPTH: 2.3 ft.
POOLS: 9
POOLS: 15 % FISH OBSERVED: Y
ASA: 25 % LIFESTAGE: AJ
ARA: 20 % IDENTITY:PS,SS,CT,CH

ADJACENT LANDFORM & VEGETATION

	LEFT BANK	*RIGHT BANK*
LANDFORM:	53	53
CANOPY:	C3	C3
INCISION:(meters)	<1	<1

	PLANT ASSOCIATION [DIST] *LEFT BANK*	PLANT ASSOCIATION [DIST] *RIGHT BANK*
PA#1:	80-200'	80-200'
PA#2:		
PA#3:		
PA#4:		
PA#5:		

TRAP RESULTS (60 min. set)
T#1 35SS,25DV,15CO,2CT
T#2 27SS,7DV,3CT
T#3 23SS,15DV,2CO

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
R.BANK	200/0				
L.BANK	200/0				

SUBSTRATE

BEDROCK:	0 %
SM BOULDER:	0 %
LG RUBBLE:	0 %
SM RUBBLE:	25 %
CRS GRAVEL:	25 %
FINE GRAVEL:	20 %
VFG/SAND:	20 %
ORGANIC/SILT:	10 %

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0	0.3	5.4	7.0	14.0	18.4	23.0	36.5	37.5
BANKFULL DEPTH(ft):	2.50	3.88	5.00	5.00	4.52	3.84	2.92	4.10	2.30
ACTIVE DEPTH(ft):	*LEFT*		1.20	1.20	0.72			0.40	*RIGHT*
THALWAG LOCATION:		AW	THWG					AW	

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft			E2		
10-25 ft	A2,B1,C6	B1,C6	C5		
25-50 ft		A1,C1	A1,C4		
50-100 ft			A1,C2,E3	A1,C1,E1	
>100 ft				A1	

AVERAGE KEY PIECE DIAMETER/LENGTH
18" 50'

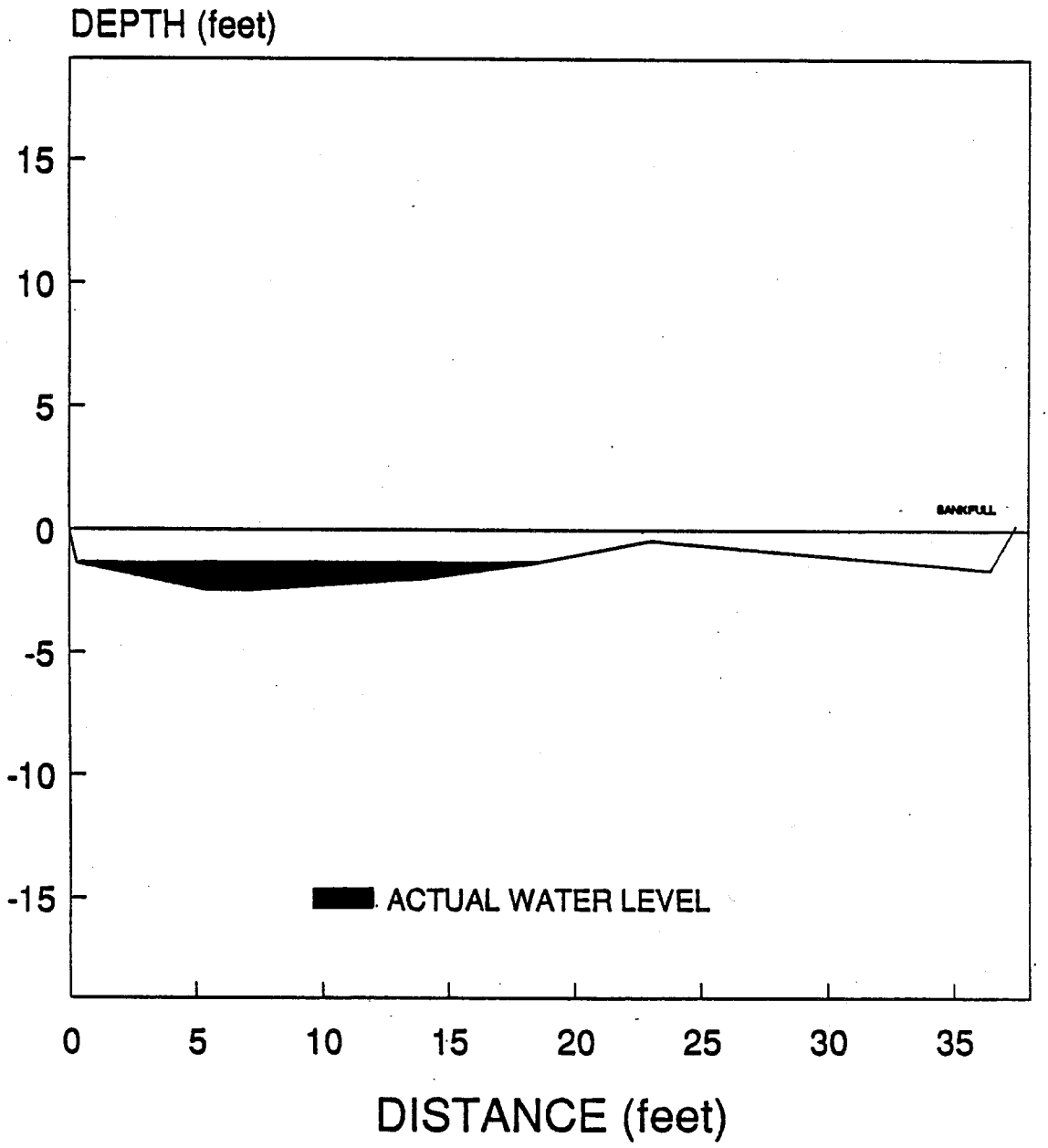
TRANSECT LENGTH: 347 ft.
CLUMP TALLEY:C6,E2
DEBRIS POOLS:A1,C3,E1

COMMENTS: Blazed large spruce on left bank; lower end marker is an alder on the left bank. Most coho were young-of-year. Former canopy was guessed at, as both sides are severely clear-cut.

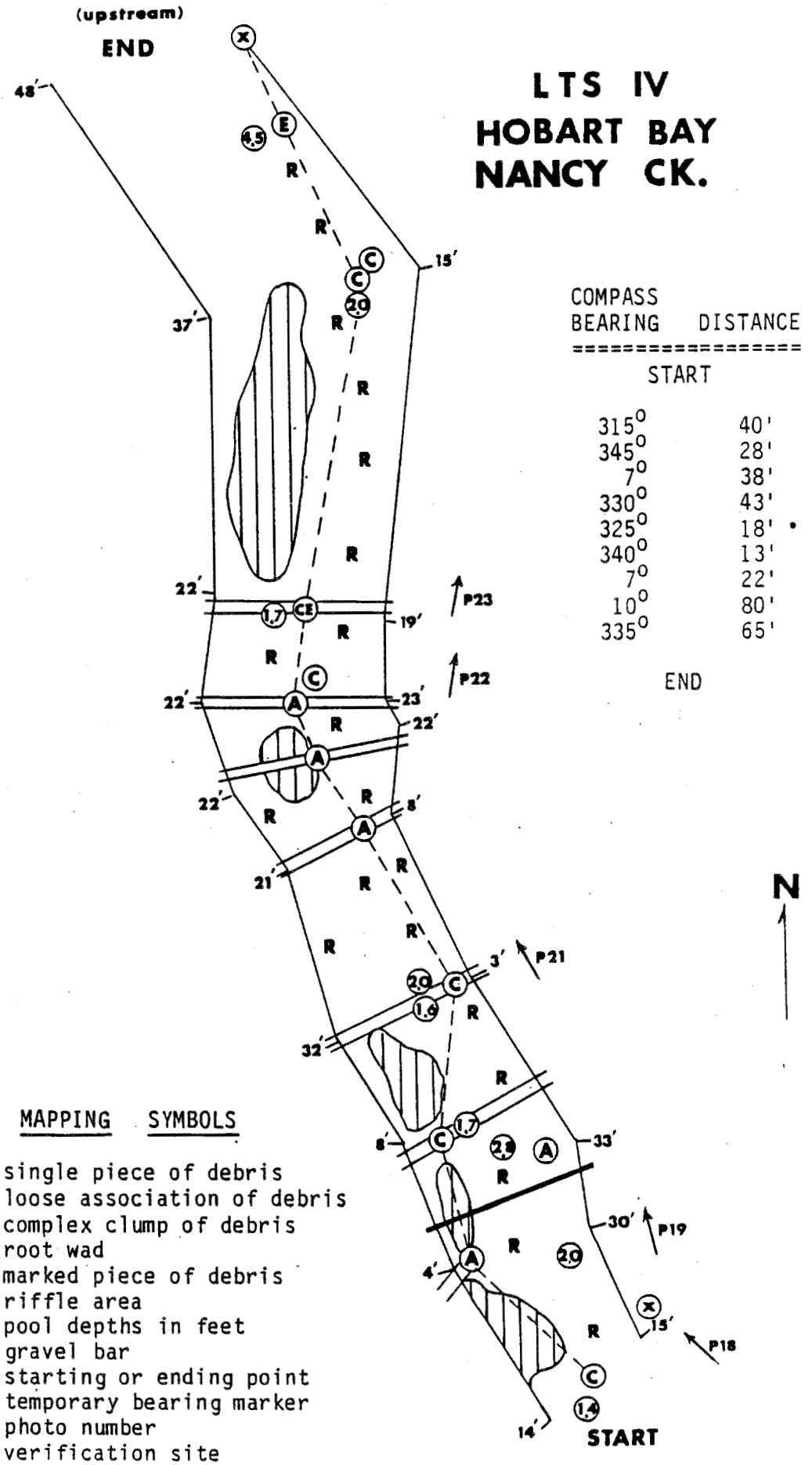
LTS IV NANCY CREEK

STREAM PROFILE

(LOOKING DOWNSTREAM)



AUGUST 8, 1989



LTS IV
HOBART BAY
NANCY CK.

COMPASS BEARING	DISTANCE
START	
315°	40'
345°	28'
7°	38'
330°	43'
325°	18'
340°	13'
7°	22'
10°	80'
335°	65'
END	

MAPPING SYMBOLS

A	single piece of debris
B	loose association of debris
C	complex clump of debris
E	root wad
◯	marked piece of debris
R	riffle area
1.7	pool depths in feet
////	gravel bar
X	starting or ending point
·	temporary bearing marker
P5	photo number
———	verification site

Distances from marked pieces to bank are indicated on the side.

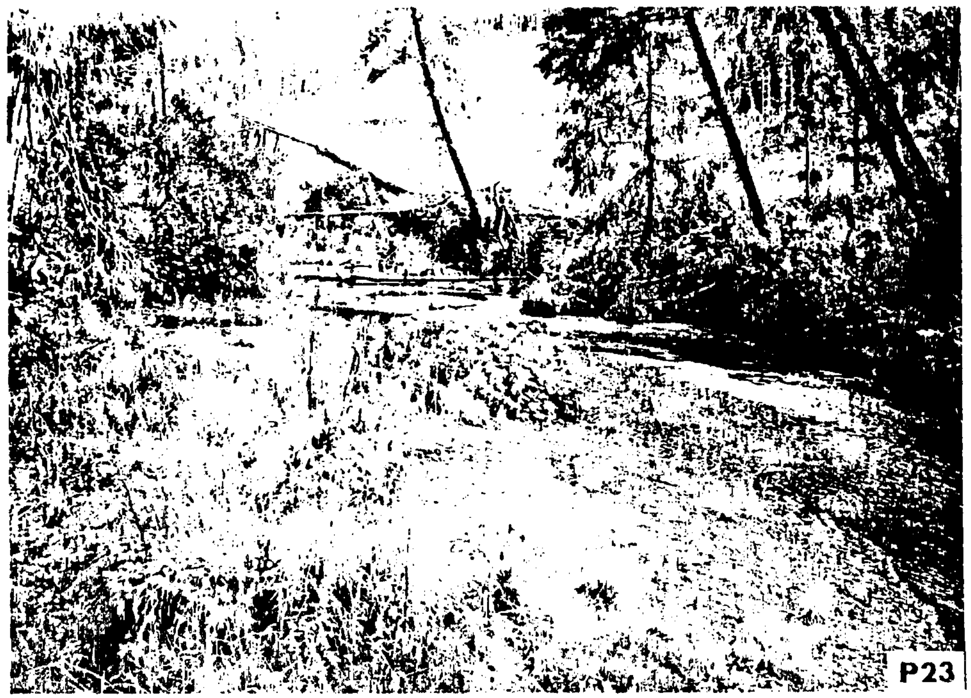
P18

P19

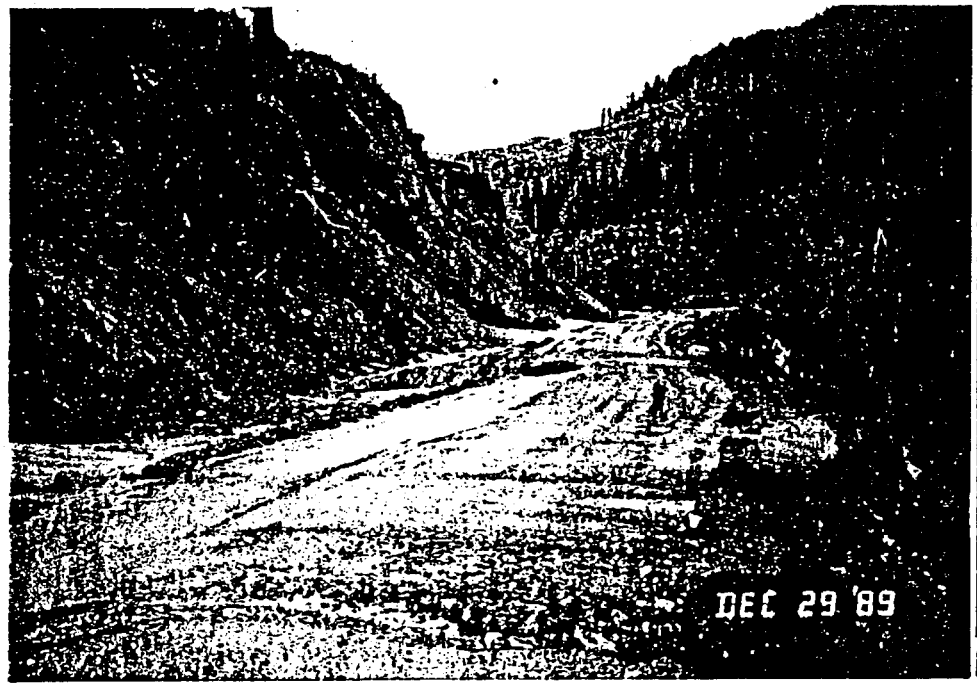
P21

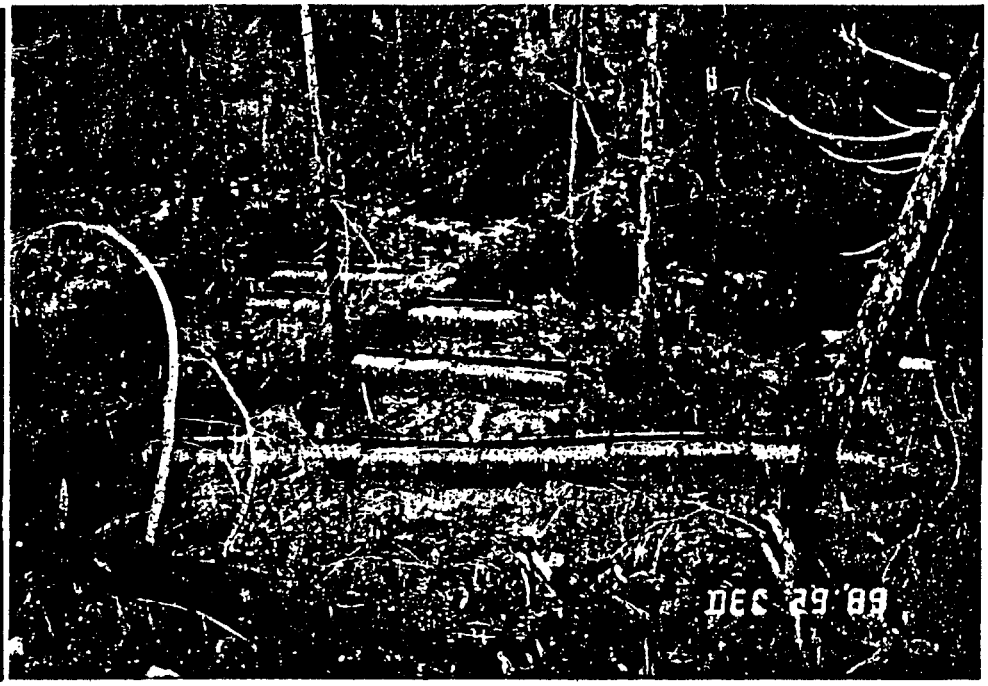
P22

LTS IV NANCY CK. HOBART BAY


P23

[illegible]





NANCY CREEK, HOBART BAY (1.5 miles above LTS IV)

PEAK ESCAPEMENT
110-33-08
HOBART BAY, NANCY CREEK

YEAR	CHUM	PINK	SOCKEYE	COHO	COMMENTS
1960	200	4500			
1961	100	2030			
1962	150	1000			
1963	400	3			
1964	0	20000			
1965	70	7000			
1966	0	10000			
1967	3	2003			
1968	0	20000			
1969	0	1500			
1970	1000	3000			
1971	15000	753			
1972	2450	10203			
1973	2100	2500			
1974	1770	5000			
1975	30	875			
1976	340	825			
1977	1300	3150			
1978	350	5000			
1979	133	1653			
1980	1347	1281			
1981	206	2700			
1982	600	11300			
1983	0	1200			
1984	1100	8500			
1985	1300	14500			
1986	53	5000			
1987	550	23600			
1988	2700	9600			
1989	1765	18500			
AVG.ALL YEARS	1167	6573			
AVG.EVEN YEARS	804	7681			
AVG.ODD YEARS	1530	5464			

110-33-08 NANCY CREEK

HABITAT ACCESSIBLE TO PINK AND CHUM SALMON

CHANNEL TYPE	LENGTH (ft.)	MEAN* ACTIVE WIDTH(ft)	ACTIVE AREA	MEAN* ASA %	ASA (sq.ft.)	ASA (sq.meters)
C1	3960	37.2	147312	35	51559	4790
B1	3960	14.5	57420	31	17800	1654
B3	3960	24.9	98604	23	22679	2107
B2	2904	8.1	23522	26	6116	568
B5	1320	20.7	27324	10	2732	254
A2	1584	27.1	42926	0	0	0
				TOTAL	152445	14162

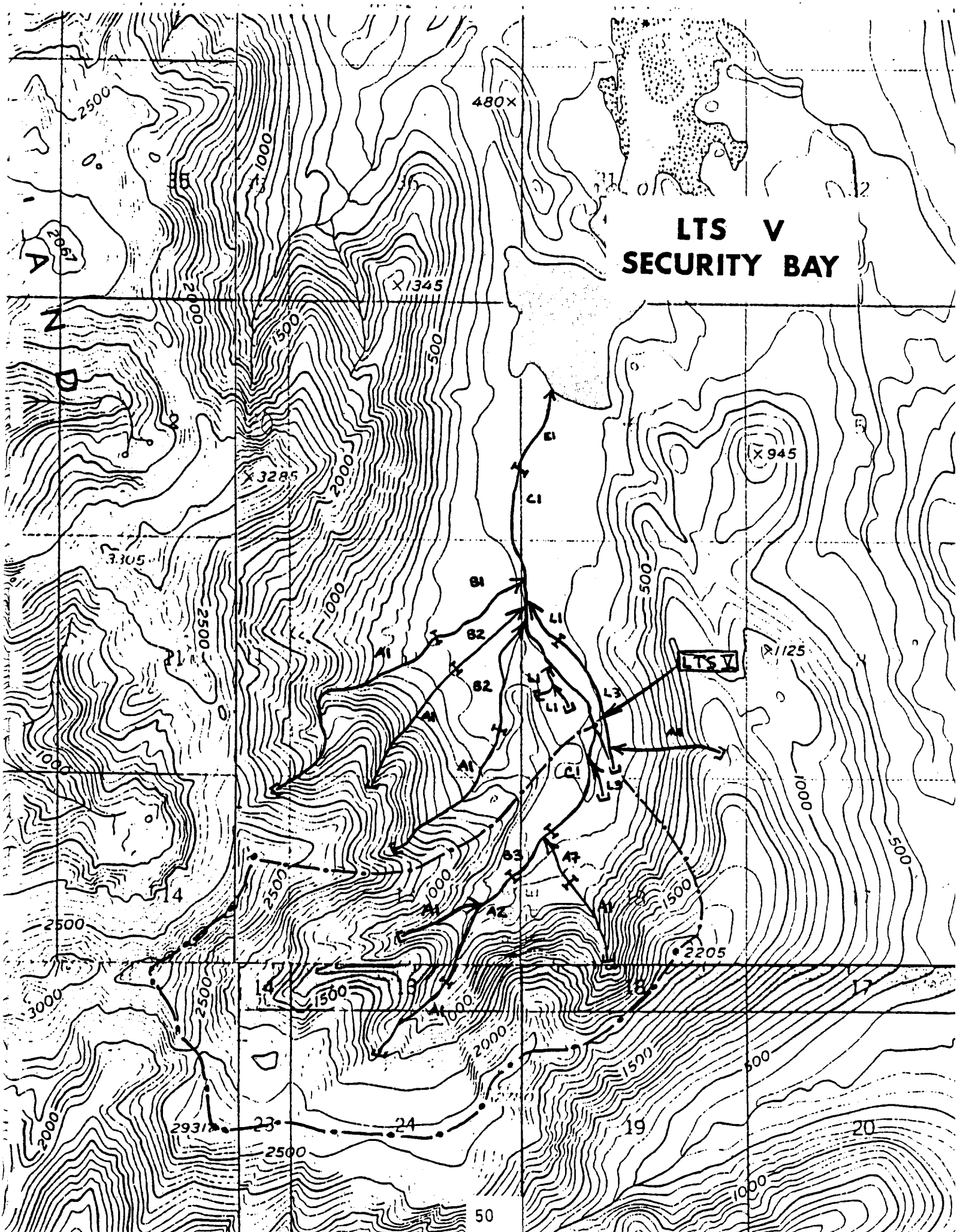
* Means taken from channel type database

HYDRAULIC SAMPLING OF SALMON EGGS

NANCY CREEK, OCTOBER 16, 1989

Sample No.	Pink	Chum	Dolly Varden
1	131 (4)	0	0
2	158 (9)	0	4
3	32 (2)	0	0
4	185 (9)	165 (8)	0
5	397 (14)	0	0

( ) dead eggs included
average egg mortality 5 percent


LTS V
SECURITY BAY
LTS V
480×
×1345
×3285
×945
×1125
2205
2931
2500
2000
1500
1000
500
3000
3305
2961
14
15
16
17
18
19
20
23
24
A1
A2
B1
B2
B3
C1
L1
L2
L3

CHANNEL TYPE VERIFICATION CARD

DATE: 89/08/22 VCU: 400 SEG: N/A SITE: LTS5 AREA: 02 **********
R.D.: 021 MGT AREA: S04 SUB SEC: 1/4 QUAD: PAX-D1-SW *PRELIM CT: C1 *
STREAM: SECURITY BAY * FINAL CT: C1 *
ADF&G: 109-45-10130 **********
BASIN AREA: 2.80 sq mi PERCENT LAKE: 0.0 % PRECIPITATION: 120 in.
SITE ELEVATION: 80 ft. MAXIMUM ELEVATION: 2918 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): 79/12/779/159 GRADIENT: 1.0 %
UPSTREAM PHOTO: DOWNSTREAM PHOTO: STREAM PATTERN: BRAIDED
WATER: 7.0 C. AIR: 13.0 C. TIME: 1000 hrs BANK CONTROL: ALLUVIUM
SITE DISTURBED: N WEATHER: CLEAR BANKFULL WIDTH: 50.0 ft.
ACTIVE WIDTH: 13.3 ft.
ADJACENT LANDFORM & VEGETATION AVG.POOL DEPTH: 1.7 ft.
LEFT BANK *RIGHT BANK* # POOLS: 7
LANDFORM: 53 53 POOLS: 20 % FISH OBSERVED: Y
CANOPY: C6 C6 ASA: 50 % LIFESTAGE: J
INCISION:(meters) <1 <1 ARA: 30 % IDENTITY:DV,SS

PLANT ASSOCIATION [DIST] * PLANT ASSOCIATION [DIST] TRAP RESULTS
LEFT BANK * *RIGHT BANK* (60 min. set)
* T#1 35SS,98DV
PA#1: 350-200' 350-200' T#2 18SS,126DV
PA#2: T#3 2SS,110
PA#3:
PA#4: *SUBSTRATE*
PA#5:

BEDROCK: 0 %
SIDESLOPE LENGTH & ANGLE SM BOULDER: 0 %
LG RUBBLE: 25 %
ft/% ft/% ft/% ft/% ft/% SM RUBBLE: 45 %
R.BANK 200/0 CRS GRAVEL: 5 %
FINE GRAVEL: 10 %
L.BANK 200/0 VFG/SAND: 10 %
ORGANIC/SILT: 5 %

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0	0.1	1.0	13.4	22.0	32.0	42.0	48.7	50.0
BANKFULL DEPTH(ft):	3.20	4.29	4.40	3.74	3.34	3.91	4.22	4.78	3.20

ACTIVE DEPTH(ft): *LEFT* 0.78 0.85 *RIGHT*
THALWAG LOCATION: AW THWG AW

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft					
10-25 ft	C1	A5,C3	A5,C2,E1	A2	
25-50 ft		A3,C3,E3	C2,E1		
50-100 ft		A1,C2	C1		
>100 ft					

AVERAGE KEY PIECE
DIAMETER/LENGTH
20" 50'

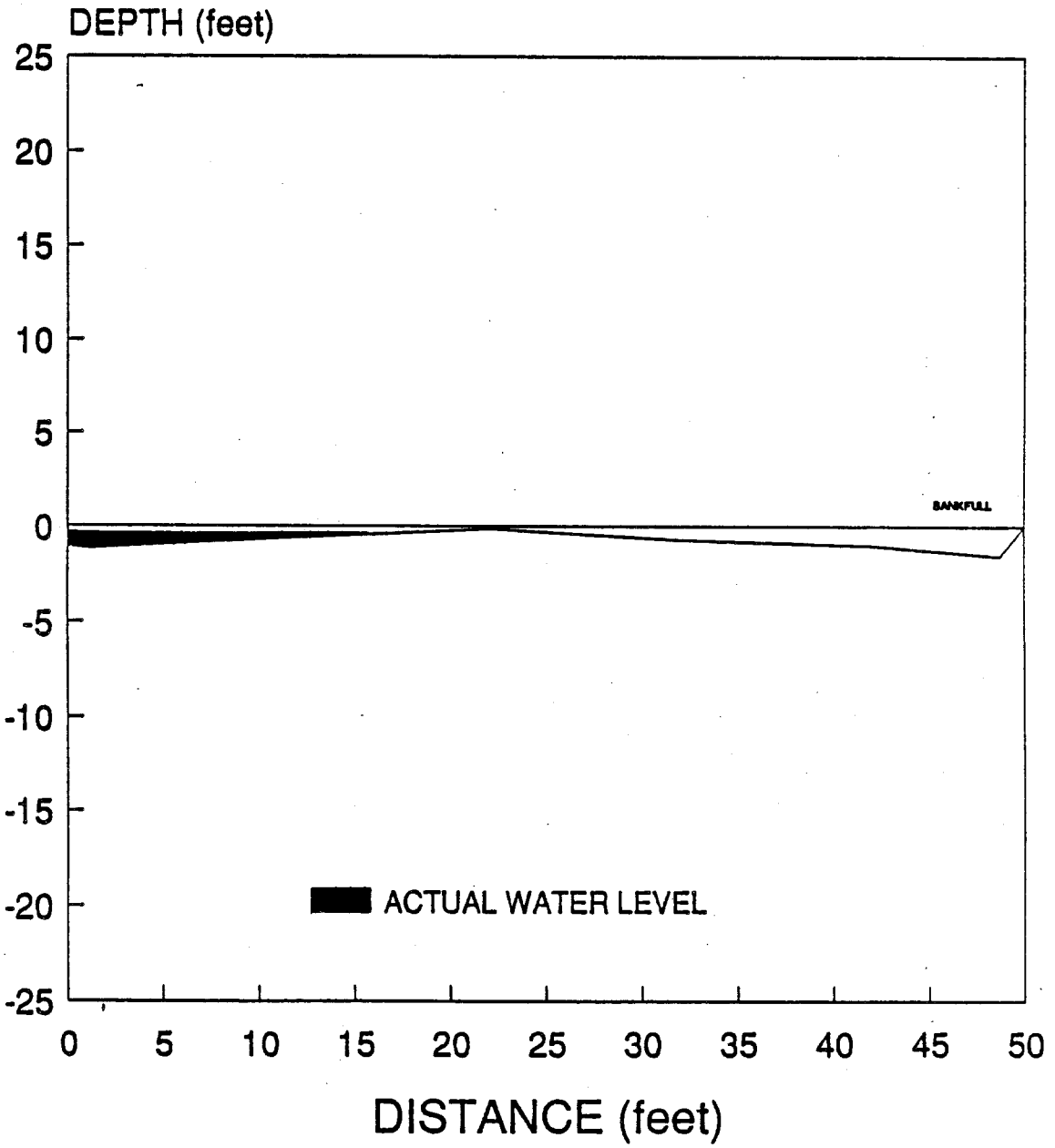
TRANSECT LENGTH: 581 ft.
CLUMP TALLEY:C4,E3
DEBRIS POOLS:A1,C4

COMMENTS: Debris was all very old and decayed, no new pieces. Vegetation on banks was badly disturbed due to beaver activity. 100m downstream from end of sample, water was being backed up from beaver dams.

LTS V SECURITY BAY

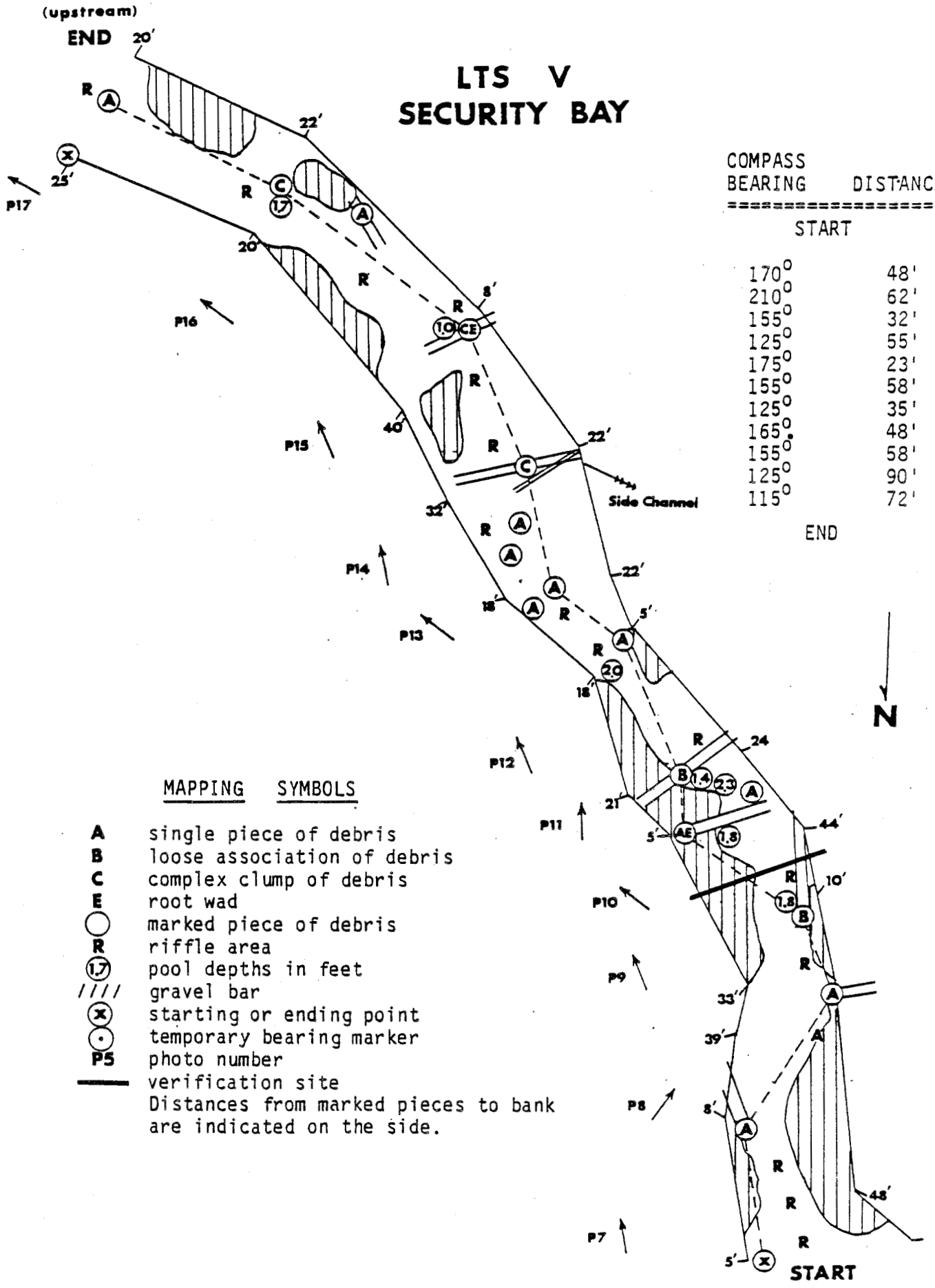
STREAM PROFILE

(LOOKING DOWNSTREAM)



AUGUST 22, 1989

LTS V
SECURITY BAY

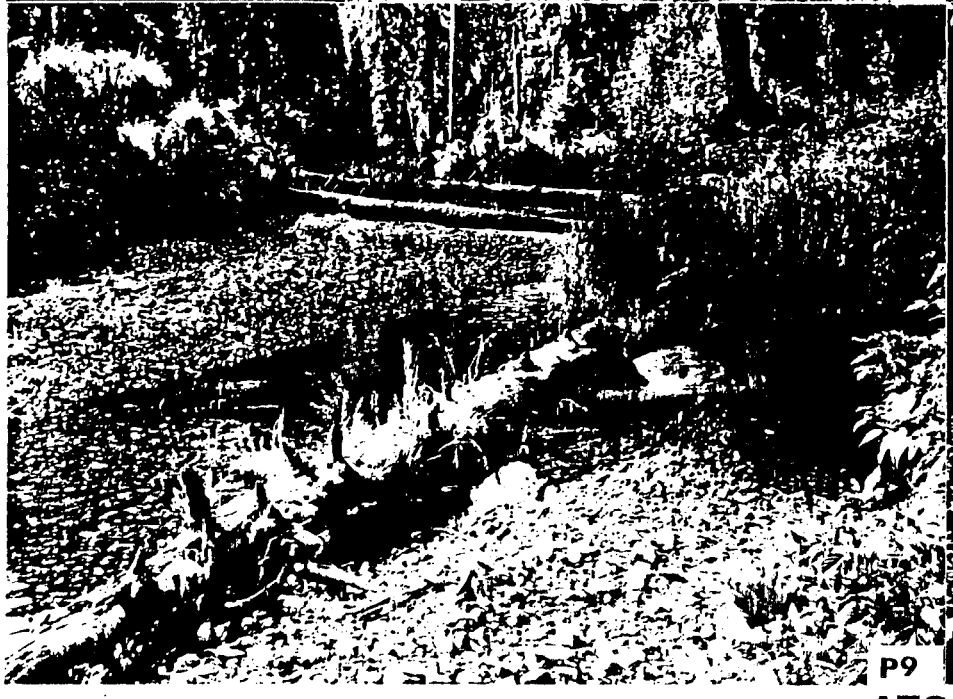


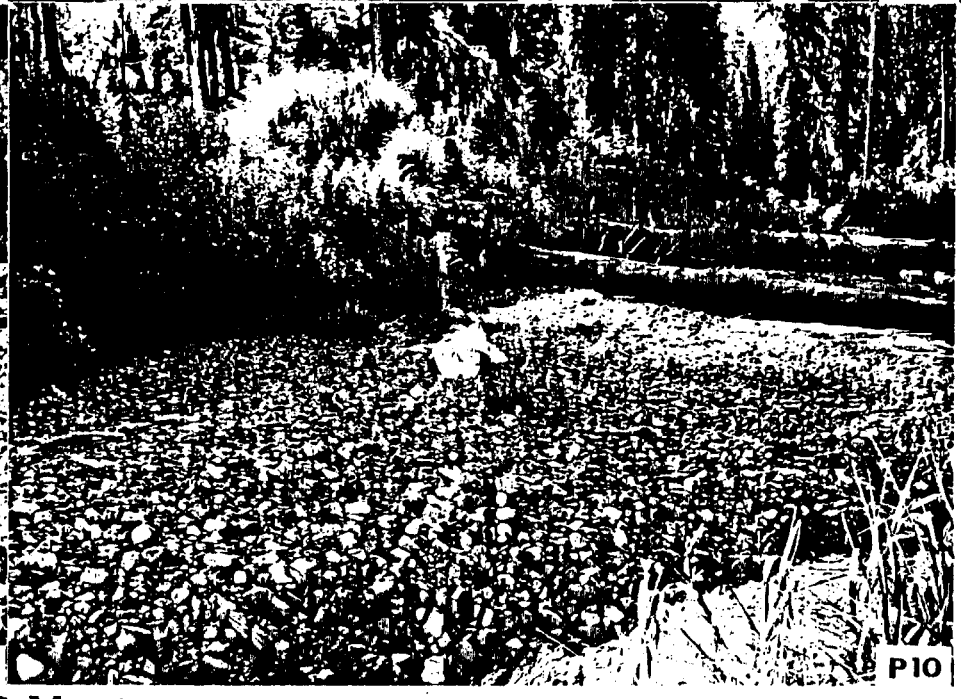
COMPASS BEARING	DISTANCE
START	
170°	48'
210°	62'
155°	32'
125°	55'
175°	23'
155°	58'
125°	35'
165°	48'
155°	58'
125°	90'
115°	72'
END	

MAPPING SYMBOLS

A	single piece of debris
B	loose association of debris
C	complex clump of debris
E	root wad
◯	marked piece of debris
R	riffle area
1.7	pool depths in feet
////	gravel bar
⊗	starting or ending point
⊙	temporary bearing marker
P5	photo number
———	verification site

Distances from marked pieces to bank are indicated on the side.





LTS V SECURITY BAY

LTSV SECURITY BAY

LTS V SECURITY BAY

PEAK ESCAPEMENT
109-45-13
SECURITY BAY

	YEAR	CHUM	PINK	SOCKEYE	COHO	COMMENTS
	1960	4000	3000			
	1961	1500	10500			
	1962	18000	15000			
	1963	1700	4003			
	1964	20000	12500			
	1965	12500	30003			
	1966	2503	2400			
	1967	1200	2500			
	1968	5000	6600			
	1969	9000	800			
	1970	13000	2503			
	1971	7000	500			
	1972	16050	565			
	1973	19992	4900			WEIR
	1974	18001	1000		19	WEIR
	1975	7119	500		114	WEIR
	1976	6810	1000			
	1977	7903	603		3	
	1978	5875	953			
	1979	1803	2433		37	
	1980	13800	3400		3	
	1981	3500	1400			
	1982	12000	2103			
	1983	4830	350			
	1984	19003	3780			
	1985	21000	17700			
	1986	12000	12600			
	1987	11200	6803			
	1988	15500	600			
	1989	8410	20000			
AVG.ALL	YEARS	10007	5700			
AVG.EVEN	YEARS	12103	4534			
AVG.ODD	YEARS	7910	6866			

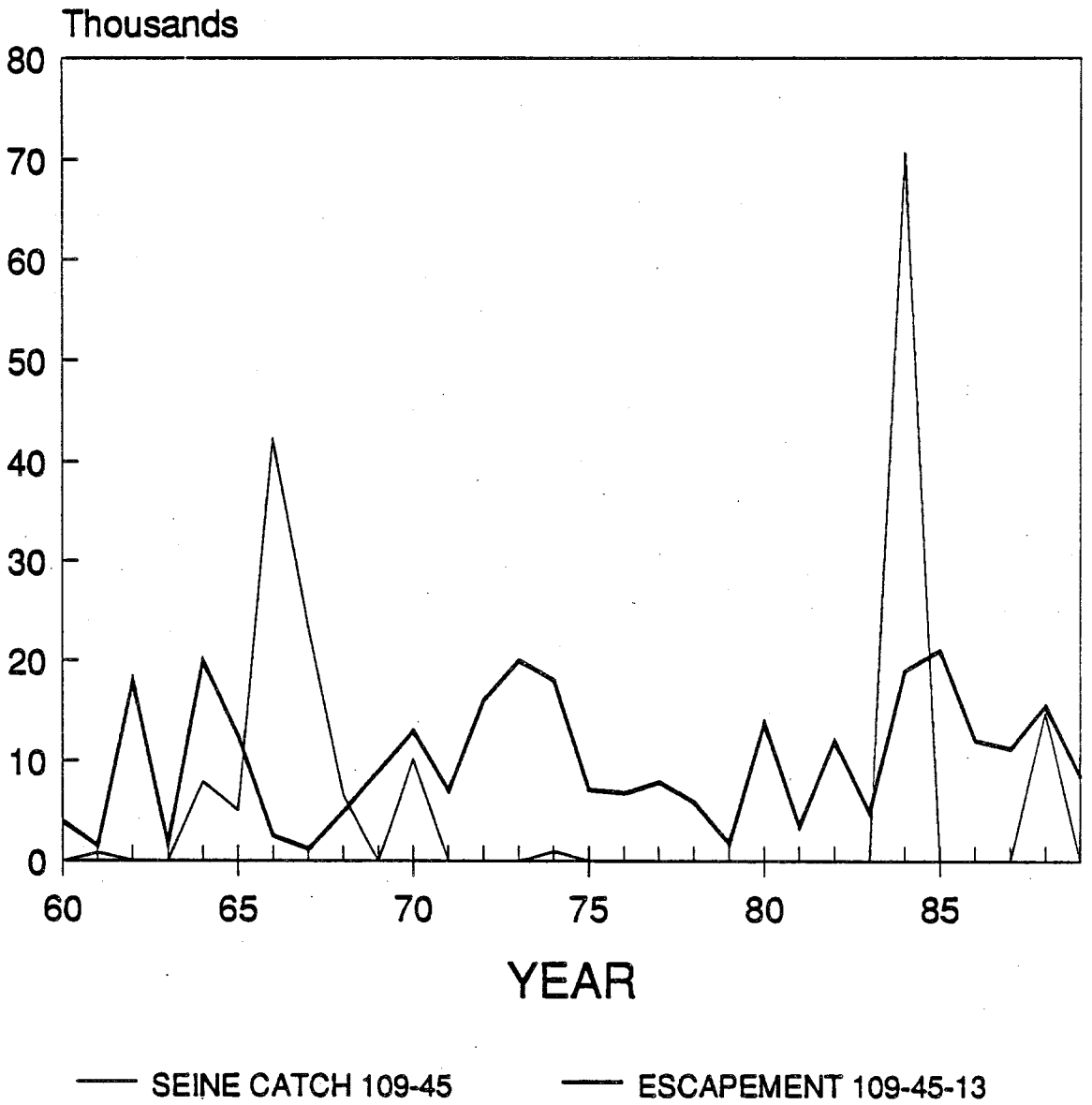
109-45-13 SECURITY BAY

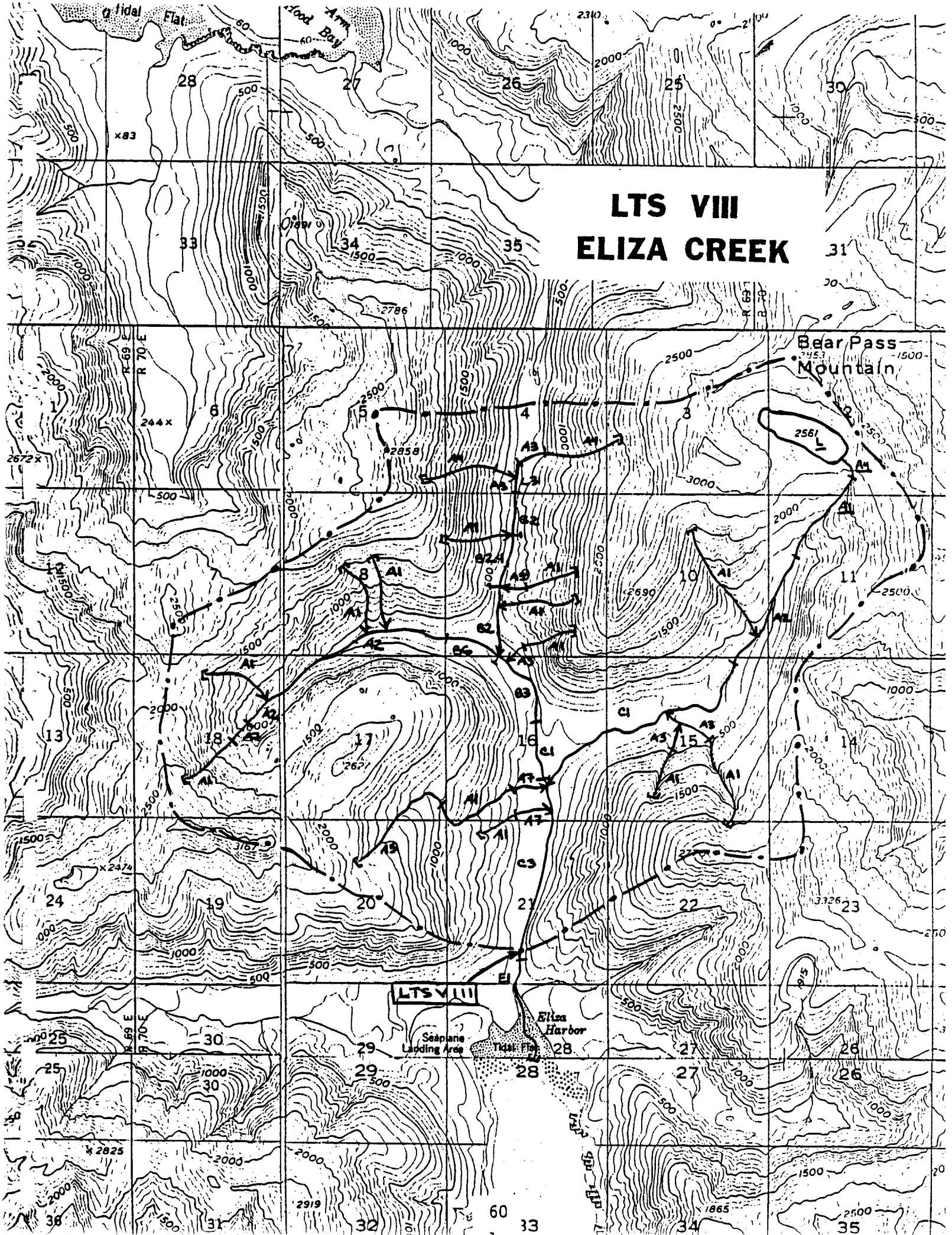
HABITAT ACCESSIBLE TO CHUM SALMON

CHANNEL TYPE	LENGTH (ft.)	MEAN* ACTIVE WIDTH(ft)	ACTIVE AREA (sq.ft.)	MEAN* ASA %	ASA (sq.ft.)	ASA (sq.meters)
C1	9574	37.2	356153	35	124653	11580
B1	2253	14.5	32669	31	10127	941
B2	4224	8.1	34214	26	8896	826
B3	1126	24.9	28037	23	6449	599
				TOTAL	150125	13947

* Means taken from channel type database

SECURITY BAY FALL CHUM SEINE CATCH VRS. ESCAPEMENT
(weeks 36 - 45)




LTS VIII
ELIZA CREEK
Bear Pass
Mountain
LTS VIII
Eliza
Harbor
Seaplane
Landing Area
Tidal Flat
Flood
Arm
Bay
R 69 E
R 70 E

CHANNEL TYPE VERIFICATION CARD

DATE: 89/08/29 VCU: 180 SEG: N/A SITE: LTS8 AREA: 03 **********
R.D.: 033 MGT AREA: SUB SEC: 1/4 QUAD: SIT-B1-SW *PRELIM CT: N/A *
STREAM: ELIZA CREEK * FINAL CT: C3 *
ADF&G: 109-30-10030 **********
BASIN AREA: 10.61 sq mi PERCENT LAKE: 1.4 % PRECIPITATION: 130 in.
SITE ELEVATION: 50 ft. MAXIMUM ELEVATION: 3495 ft.
AEROPHOTO (YR/FLT/ROLL/PHOTO): GRADIENT: 0.5 %
UPSTREAM PHOTO: 903-20 DOWNSTREAM PHOTO: 903-21 STREAM PATTERN: MULTIPLE
WATER: 9.0 C. AIR: 19.0 C. TIME: 1400 hrs BANK CONTROL: ALLUVIUM
SITE DISTURBED: Y WEATHER: OVERCAST BANKFULL WIDTH: 78.0 ft.
ACTIVE WIDTH: 68.0 ft.
AVG.POOL DEPTH: 2.5 ft.
POOLS: 1
POOLS: 50 % FISH OBSERVED: Y
ASA: 25 % LIFESTAGE: JA
ARA: 5 % IDENTITY:PS,SS,CH,DV

ADJACENT LANDFORM & VEGETATION

	LEFT BANK	*RIGHT BANK*
LANDFORM:	51	53
CANOPY:	C3	C3
INCISION:(meters)	<1	<1

PLANT ASSOCIATION [DIST]

	LEFT BANK	*	*RIGHT BANK*
PA#1:	320/200'	*	350/200'
PA#2:		*	
PA#3:		*	
PA#4:		*	
PA#5:		*	

TRAP RESULTS (60 min. set)
T#1 N/A
T#2 N/A
T#3 N/A

SUBSTRATE

BEDROCK:	0 %
SM BOULDER:	1 %
LG RUBBLE:	3 %
SM RUBBLE:	30 %
CRS GRAVEL:	5 %
FINE GRAVEL:	5 %
VFG/SAND:	26 %
ORGANIC/SILT:	30 %

SIDESLOPE LENGTH & ANGLE

	ft/%	ft/%	ft/%	ft/%	ft/%
R.BANK	200/0				
L.BANK	200/80				

STREAM GEOMETRY

	BF	*LB*	****	****	****	****	****	*LB*	*BF*
DISTANCE(ft):	0.0	5.8	13.3	15.0	30.0	40.0	45.0	73.0	78.0
BANKFULL DEPTH(ft):	3.40	3.74	4.20	4.32	5.70	6.40	6.16	3.84	2.44
ACTIVE DEPTH(ft):	*LEFT*			0.20	1.78	2.56	2.38		*RIGHT*
THALWAG LOCATION:			AW			THWG		AW	

L.O.D. TALLEY (DIAMETER)

(LENGTH)	4 - 6"	6 - 12"	12 - 24"	24 - 36"	>36"
< 10 ft					
10-25 ft					
25-50 ft					
50-100 ft					
>100 ft					

AVERAGE KEY PIECE DIAMETER/LENGTH

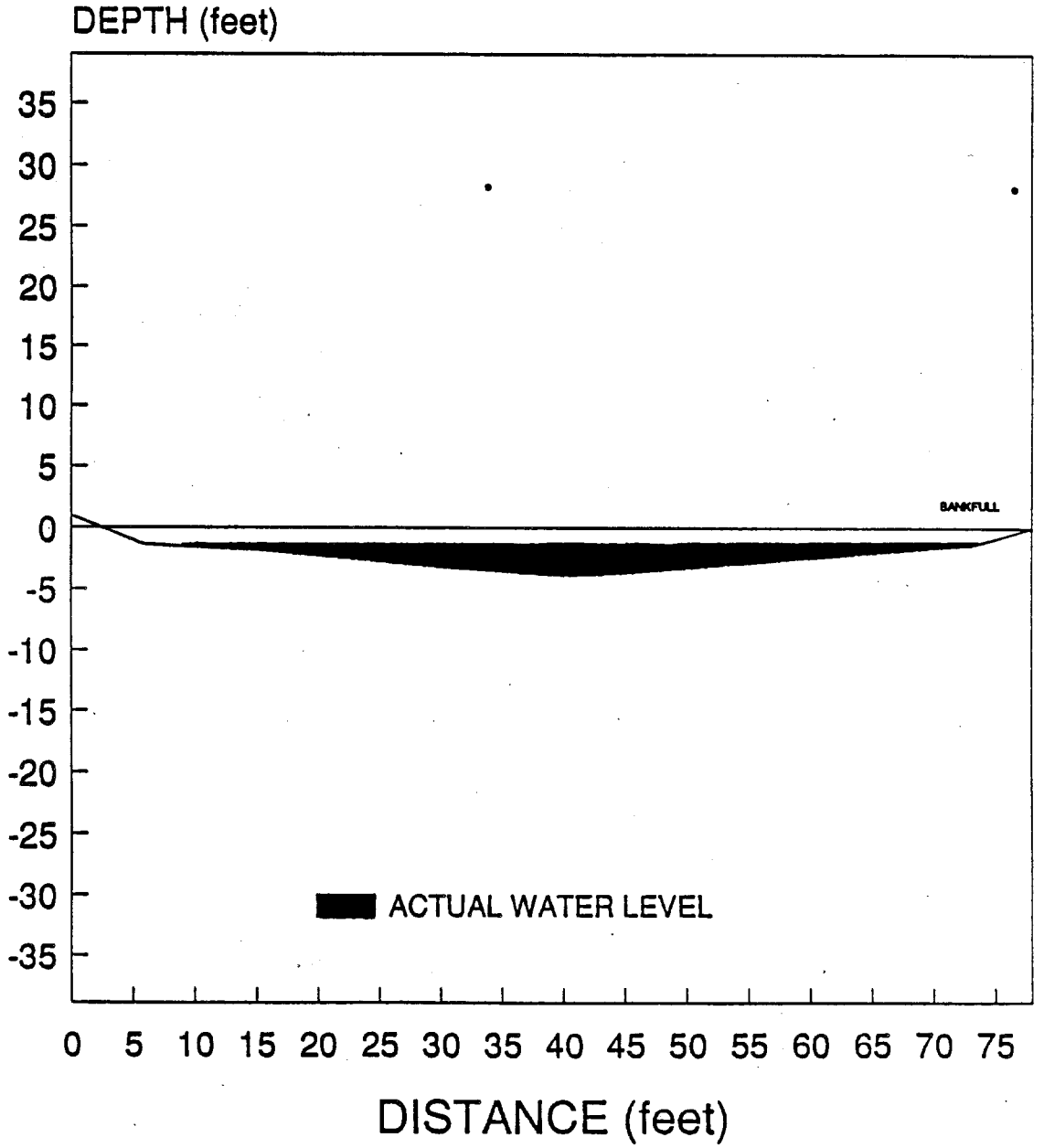
TRANSECT LENGTH: 222 ft.
CLUMP TALLEY:
DEBRIS POOLS:

COMMENTS: No traps set, few SS and many DV fry seen. 1590 PS, 32 CH, 35 dead PS, 1 dead CH in study area. Mouth to forks: 90,600 PS, 11,400 CH. This watershed was cat-logged begining in 1963. Dense stands of alder are found throughout the watershed.

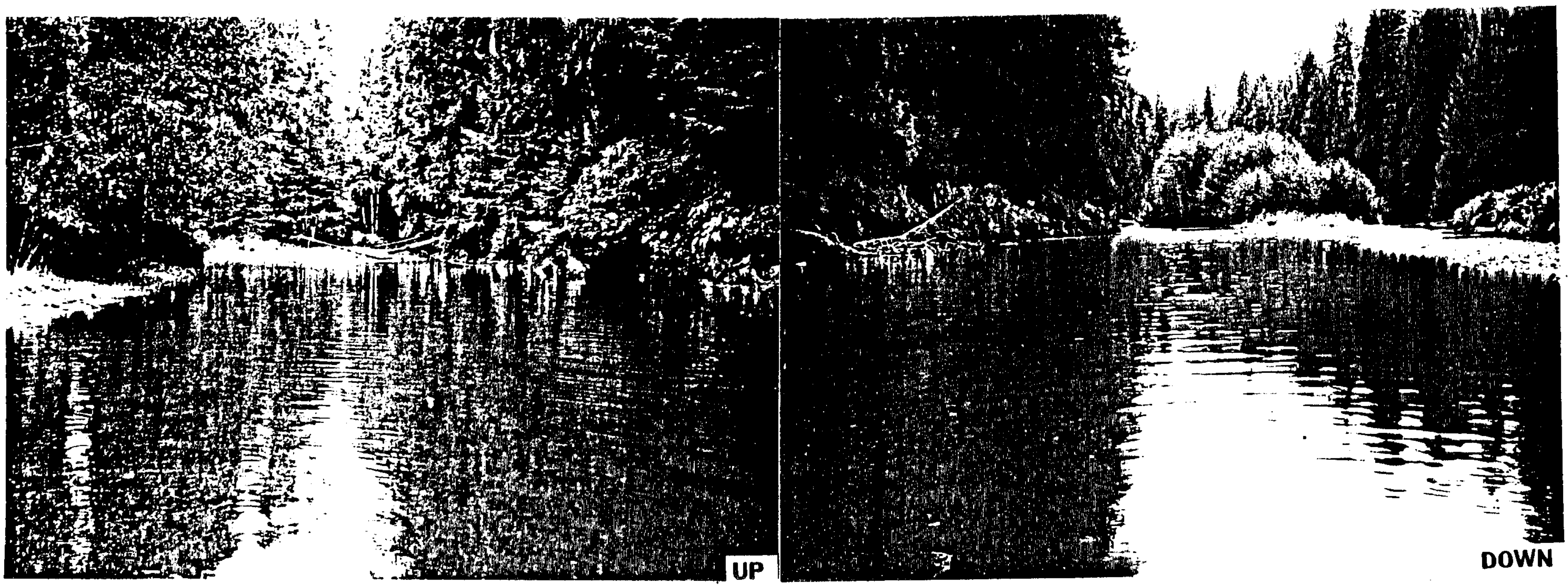
LTS VIII ELIZA CREEK

STREAM PROFILE

(LOOKING DOWNSTREAM)



AUGUST 29, 1989

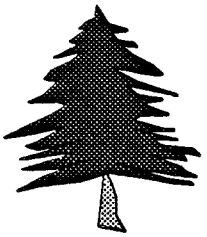


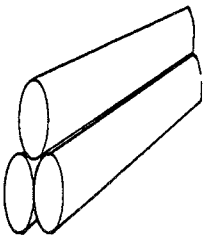
LT VII ELIZA CREEK

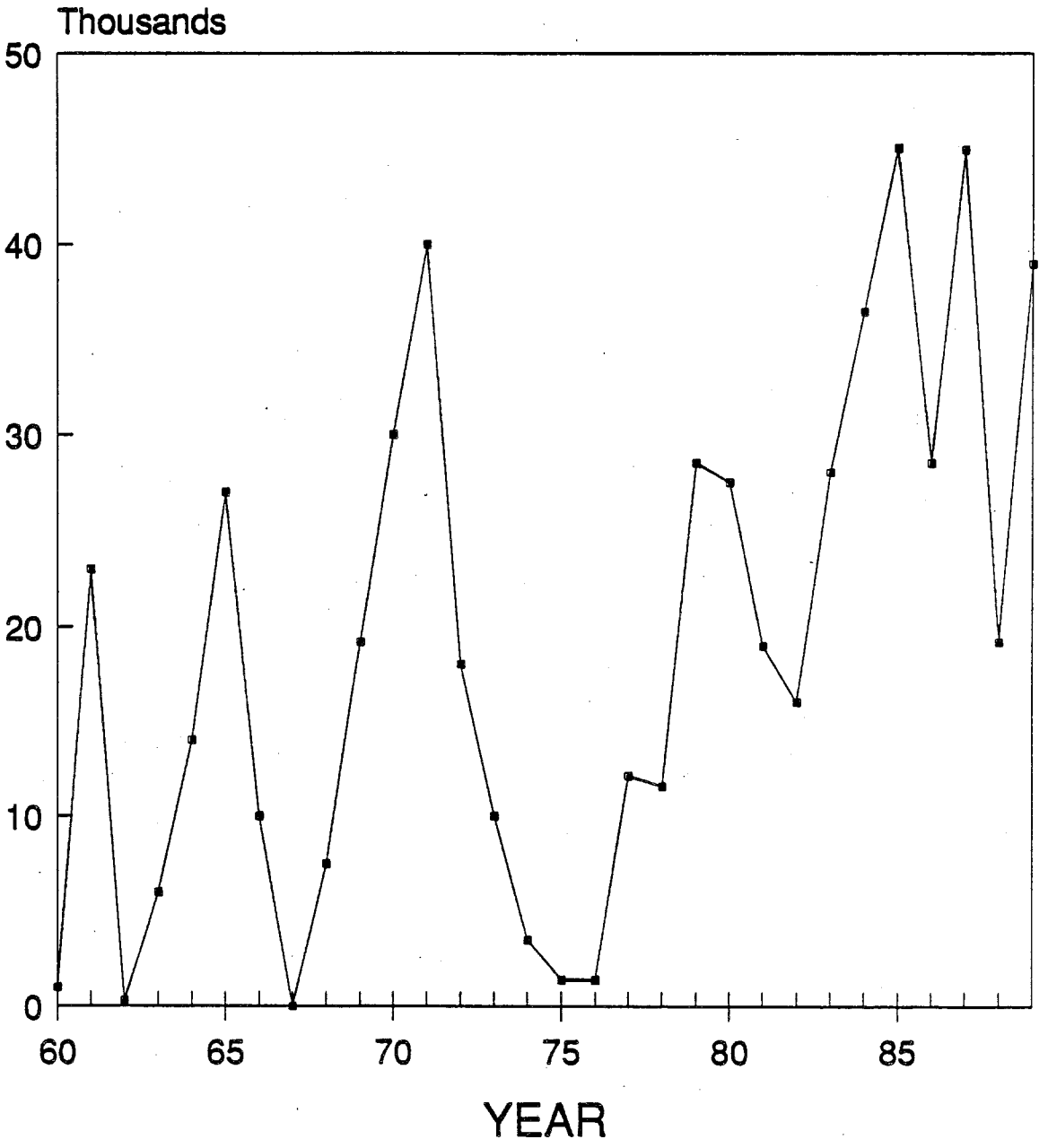
PEAK ESCAPEMENT
109-30-03
ELIZA CREEK

YEAR	CHUM	PINK	SOCKEYE	COHO	COMMENTS
1960	1500	1003			
1961	0	23000			
1962	0	300			
1963	50	6000			
1964	0	14000			
1965	0	27000			
1966	0	10000			
1967	8200	0			
1968	0	7503			
1969	0	19200			
1970	0	30003			
1971	0	40003			
1972	0	18003			
1973	1500	10000		2	
1974	600	3500			
1975	250	1400			
1976	1320	1400			
1977	200	12090		20	
1978	475	11550			
1979	0	28500			
1980	1500	27503		10	
1981	600	19000			
1982	40	16000			
1983	92	28030			
1984	2903	36500			
1985	3	45000			
1986	156	28500			
1987	240	44900			
1988	350	19200			
1989	11400	39000		147	
AVG.ALL YEARS	1046	18936			
AVG.EVEN YEARS	590	14998			
AVG.ODD YEARS	1502	22875			

ELIZA CREEK
PINK ESCAPEMENT

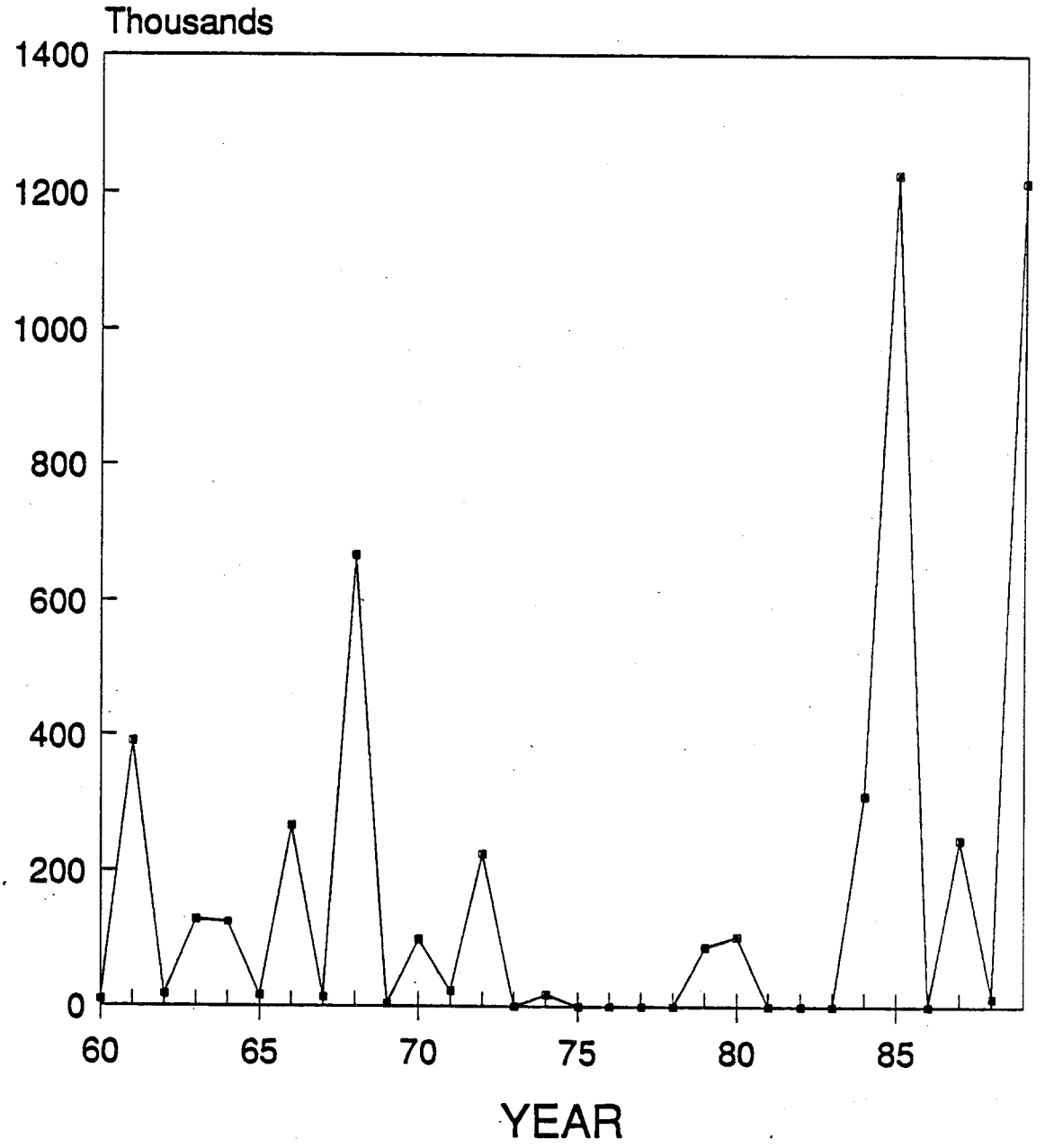




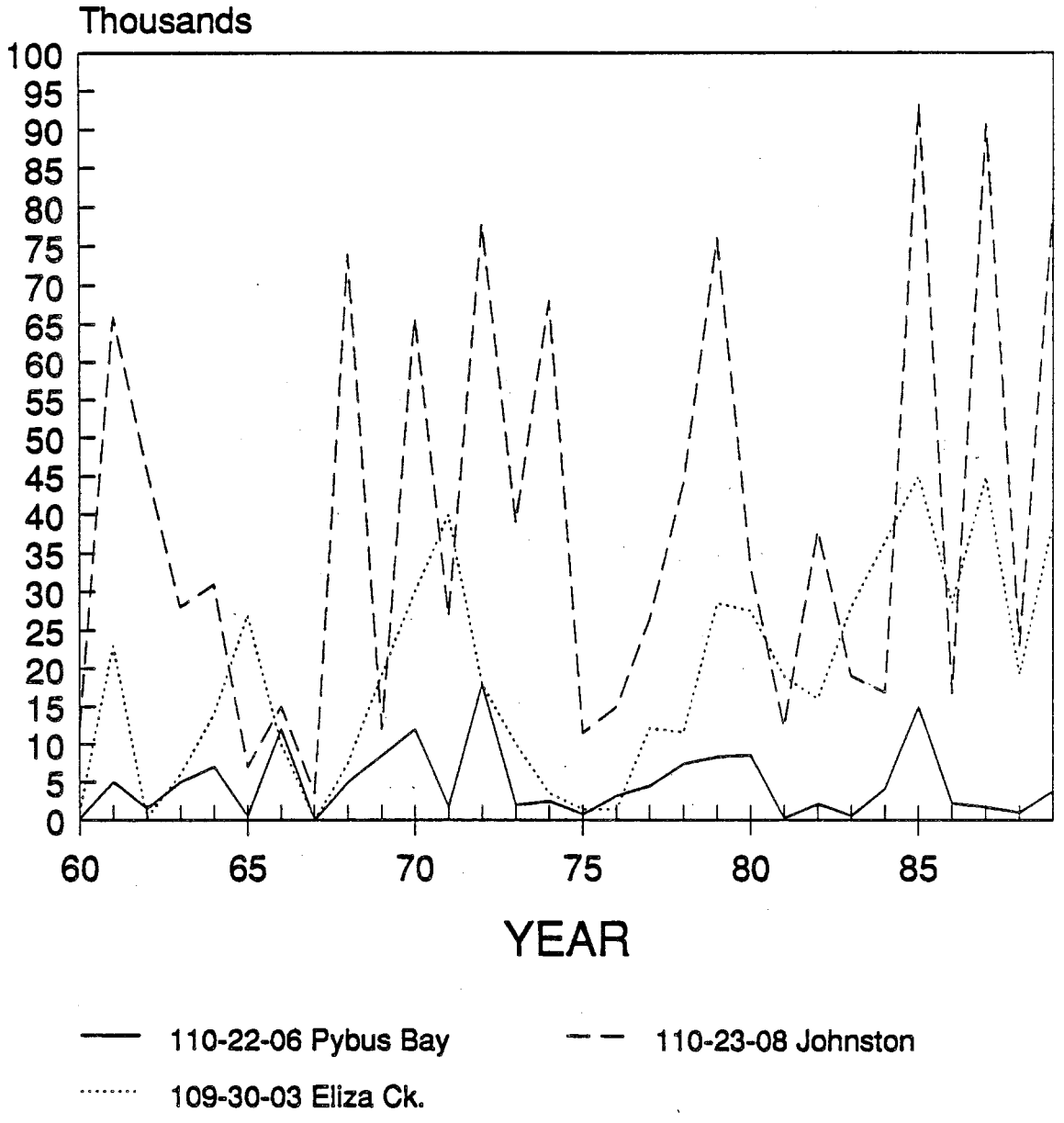


SEINE CATCH (PINKS)

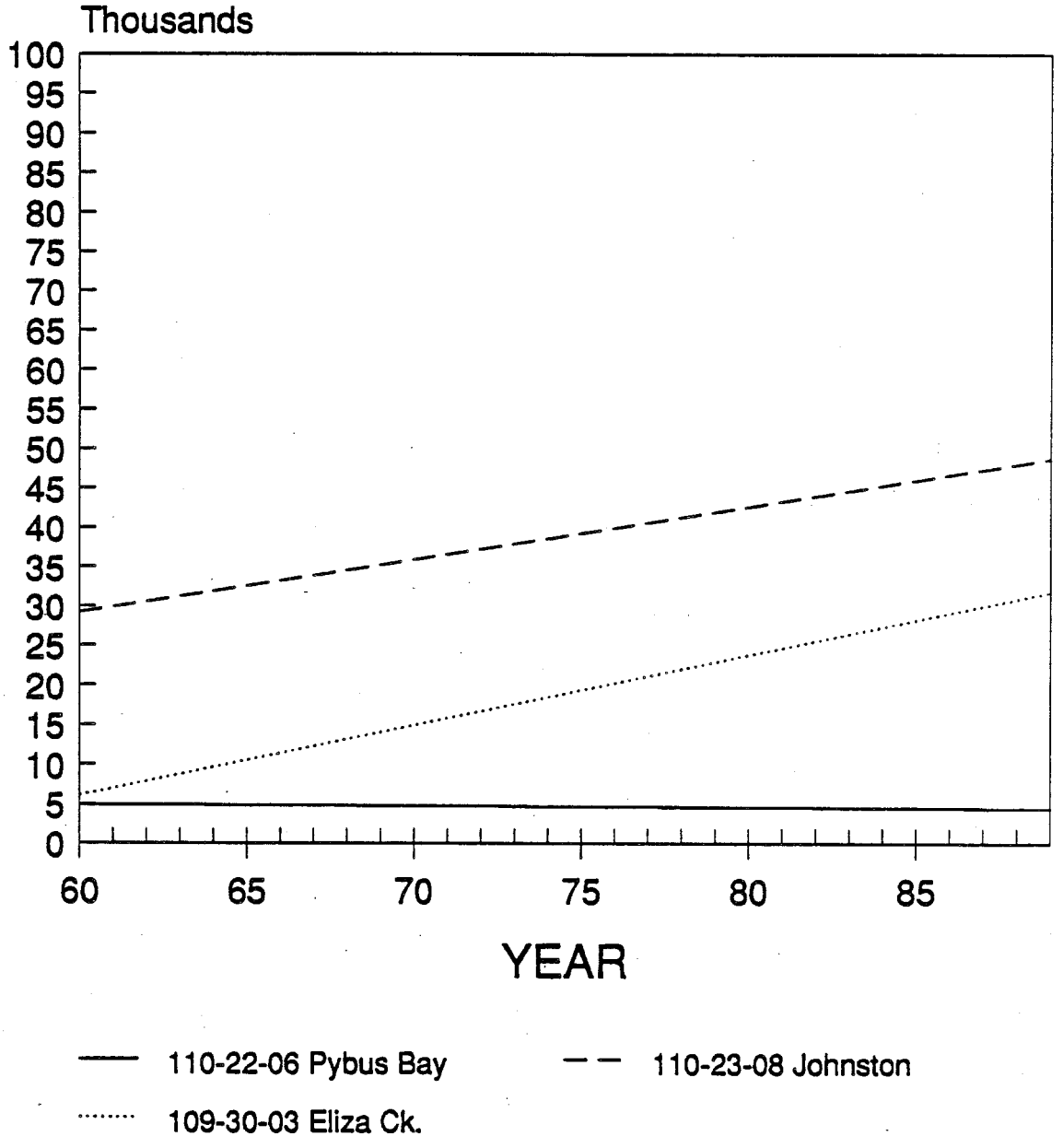
109-30



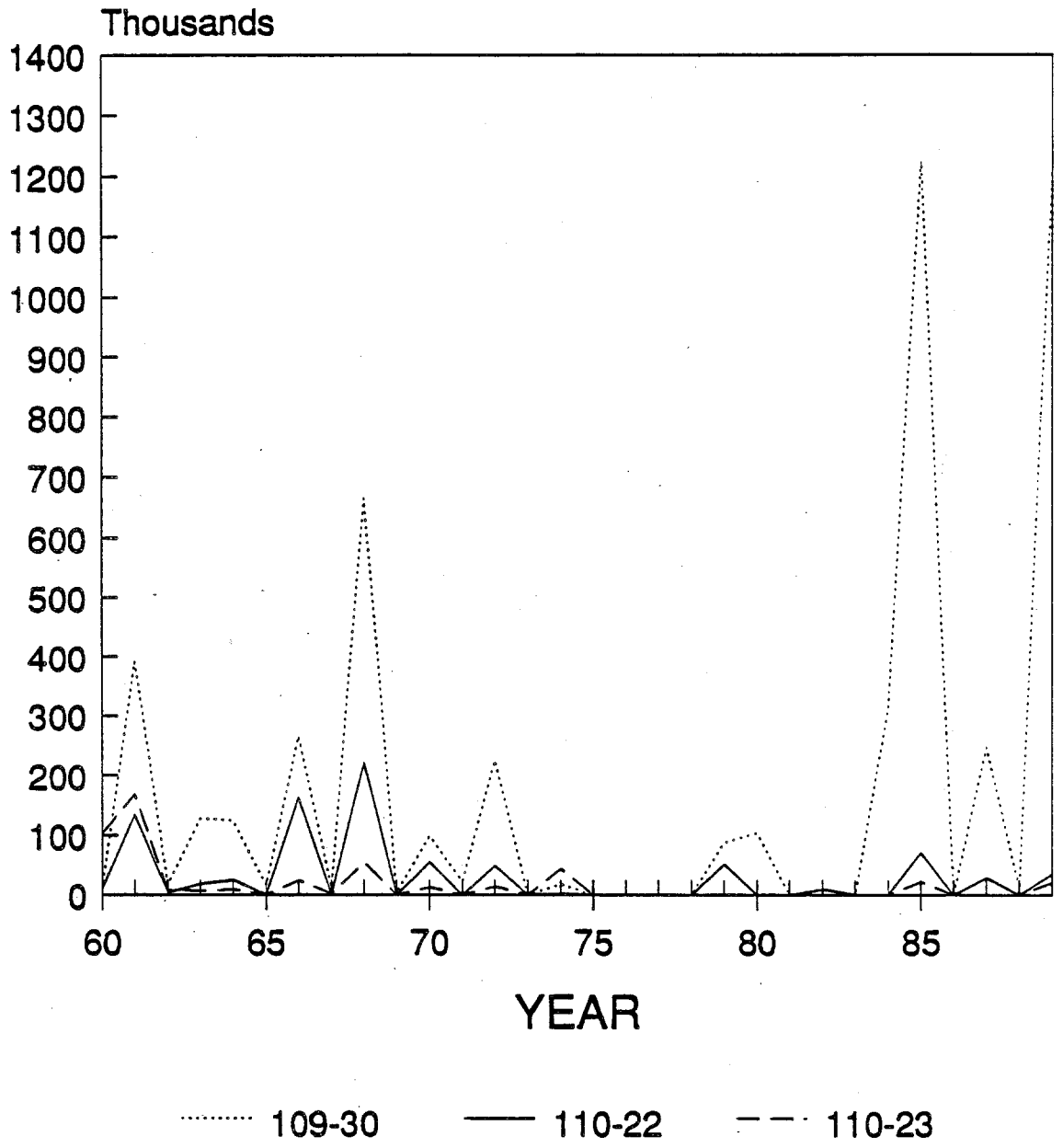
PINK ESCAPEMENT
1960 thru 1989



PINK ESCAPEMENT TRENDS
1960 thru 1989



SEINE CATCH (PINKS)
109-30, 110-22, 110-23



VOLUME OF LARGE WOODY DEBRIS AT STUDY SITES

SITE LOCATION	CHANNEL TYPE	VOLUME A (m3)	VOLUME B (m3)	VOLUME C (m3)	TOTAL m3	BANKFULL WIDTH (ft)	SITE LENGTH (ft)	AREA (m2)	VOLUME m3/100m2
LTS I Shipley Bay	C3.3	5.4661	15.4707	154.0801	175.0169	55.0	667	3408	5.14
LTS II Salmon Bay	C1	30.2742	0.6880	95.6241	126.5863	35.7	353	1171	10.81
LTS III Kadake Cr.	C3	23.6364	0.0000	161.3589	184.9953	73.0	612	4150	4.46
LTS IV Hobart Bay	C1	30.5588	0.2865	37.0076	67.8529	37.5	347	1209	5.61
LTS V Security Bay	C1	19.7205	0.0000	36.4612	56.1817	50.0	581	2699	2.08
LTS VI Salmon Bay	C1	27.9648	13.0779	34.0728	75.1155	61.1	390	2214	3.39
LTS VII Kadake Cr.	C1	9.5126	0.0000	17.6342	27.1468	50.0	638	2964	0.92

LARGE WOODY DEBRIS INVENTORY PROCEDURES

The overall purposes of the woody debris portion of the verification card were to determine, for each channel type:

1. The volume of Large Woody Debris (LWD) that typically occurs within each channel type.

In order to manage LWD, we need to know how much occurs naturally within the stream channel. Our general approach to debris management in the past has been to assume that if we can maintain natural loading levels, we will not affect habitat or channel stability. Therefore, we need to have some idea how much needs to be provided to the channel. Lacking information on input rates (volume per unit time), we will have to make some assumptions about input frequency and storage residence time. By determining LWD volumes in several samples for each CT, we should be able to approximate how much material occurs within each CT.

2. What size and/or grouping of LWD remains stable in the channel over time and is most effective in providing pool habitat and channel stability.

Besides knowing how much LWD occurs within the CT, we need to know what size of material is effective in creating habitat and maintaining channel stability. Just providing LWD volume in an amount equivalent to natural loading is not sufficient. We must provide material in those ranges which will hang up in the channel and create the effect (i.e., habitat structures and bank/bed stabilization) that we are trying to mimic. Therefore, we need to know what size range of material generally remains in storage within each CT, and how much of this key-sized material occurs naturally.

3. How much pool habitat is associated with LWD.

If we are going to consciously decide to maintain less LWD than natural in any given CT, we need to have some idea of how much habitat (and, thereby, fish) we are sacrificing. It is the feeling among fisheries biologists that pool habitat is the most limiting factor in determining habitat capability for coho. Coho rearing is limited by available low-flow, winter habitat. Low-flow, winter habitat means pools. Forest management will primarily affect those pools created or associated with LWD. If we can determine how much pool habitat is associated with LWD, we could estimate, or at least evaluate, how much habitat may be lost if we reduce LWD loading and/or character in the channel.

The following pages provide possible values to be obtained during the analysis along with techniques to obtain them.

TOTAL VOLUME

Volumes in individual size classes will be calculated using the Doyle log volume formula:

$$V = Am * L$$

where Am = cross sectional area of midpoint of log
L = length of log

Knowing the number of pieces in each size class, we could facilitate the calculation of volume in each clump association by modifying the Doyle formula to read :

$$K = Am * Lm$$

where K = volume of each log in that size class (m3)

Am = cross sectional area at midpoint of diameter class (m2)
Lm = midpoint of length class (meters)

Therefore: V = K * (number of pieces)

which will yield values for volume in each size class, by clump association, in cubic meters.

The K values for each size class are:

	4-6"	6-12"	12-24"	24-36"	>36"
<10 ft	.0386	.1251	.5004	1.3900	2.0016
10-25 ft	.0676	.2189	.8757	2.4325	3.5028
25-50 ft	.1448	.4691	1.8765	5.2125	7.5060
50-100 ft	.2896	.9382	3.7530	10.4250	15.0120
>100 ft	.3861	1.2510	5.0040	13.9000	20.0160

Several studies at Oregon State University have used this method of debris clump categorization, and have found it to be simple to use in the field and very effective at describing the distribution of debris within a stream reach. In the field, when a worker comes to a debris clump, a tally mark is made to keep a count of the number of that type of clump found within the study reach. The debris pieces are then measured and recorded in the proper size box next to the appropriate clump type letter.

AVERAGE KEY PIECE: Diameter:_____in Length:_____ ft

	DIAMETER (INCHES)									
LENGTH	4 - 6 IN.		6 - 12		12 - 24		24 - 36		>36 IN.	
ROOT WADS	A	B	A	B	A	B	A	B	A	B
<10 FT.	C	E	C	E	C	E	C	E	C	E
10-25 feet	A	B	A	B	A	B	A	B	A	B
	C	E	C	E	C	E	C	E	C	E
25-50 ft.	A	B	A	B	A	B	A	B	A	B
	C	E	C	E	C	E	C	E	C	E
50-100 feet	A	B	A	B	A	B	A	B	A	B
	C	E	C	E	C	E	C	E	C	E
>100 feet	A	B	A	B	A	B	A	B	A	B
	C	E	C	E	C	E	C	E	C	E

CLUMP TALLY: B _____ C _____ E _____

TOTAL NUMBER OF POOLS: _____

DEBRIS ASSOCIATED POOLS: A ____ B ____ C ____ E ____

COMMENTS:_____

Each piece of debris is entered in the proper size category box on the debris tally sheet next to the appropriate clump association designation (A,B,C,E). The clump association types were defined as follows:

A. Single piece of debris.
B. Loose association of debris, independent of number of pieces, that are not collinear in orientation or tightly packed and generally do not trap smaller debris pieces.
C. Complex debris jams, including both single and multi-tier jams.
E. Root wads. All pieces of debris with root wads were double tallied with a mark being put alongside the E in the appropriate size class. This was done to determine the importance of root wads in anchoring debris in certain channel types.

When a pool was encountered a tally mark was also put alongside the appropriate debris type and a tally kept on the total number of pools.

LONG TERM SITE STREAMFLOW DATA

LONG TERM SITE	CHANNEL TYPE	BANKFULL AREA(sqft)	MEAN OCTOBER FLOW(cfs)	MEAN AUGUST FLOW(cfs)	WINTER LOW FLOW(cfs)	100 YEAR PEAK FLOW(cfs)	5 YEAR PEAK FLOW(cfs)
LTS I Shipley Bay	C3.3	112.20	63	21	1.73	1915	1247
LTS II Salmon Bay	C1	78.54	29	11	0.72	938	589
LTS III Kadake Ck.	C3	89.30	118	44	4.01	3002	1891
LTS IV Nancy Ck.	C1	61.87	43	31	1.18	1381	836
LTS V Security Bay	C1	39.50	35	22	0.87	948	586
LTS VI Salmon Bay	C1	143.59	52	22	1.30	1520	949
LTS VII Kadake CK.	C1	159.18	34	14	0.91	1055	667
LTS VIII Eliza Ck.	C3	168.48	122	83	3.88	2984	1830

Streamflow equations taken from WATER RESOURCES ATLAS
U.S. Department of Agriculture
Forest Service - Region 10
Juneau, Alaska

11T - Mean October Flow

$$Q = 1.26\ P_M^{.981}\ A^{1.05}\ C^{-.169}$$

9T - Mean August Flow

$$Q = .00129\ P_M^{1.43}\ A^{.952}\ T^{.0181}\ E^{.671}\ C^{.179}$$

21T - 7Q5 Winter Low Flow

$$Q = .0397\ P^{.671}\ A^{1.25}\ T^{-.0364}\ L^{.247}\ C^{-.349}$$

19T - 100-Year Peak Flow

$$Q = 30.3\ P^{1.06}\ A^{.904}\ L^{-.359}\ E^{-.371}$$

15T - 5-Year Peak Flow

$$Q = 17.8\ P^{1.20}\ A^{.907}\ L^{-.346}\ E^{-.461}$$

DEFINITION OF VARIABLES

Q = flow (cubic feet per second)

P = mean annual precipitation (inches)

P_M = mean monthly precipitation (inches)

A = area (square miles)

T = proportion of basin above tree line (percent)

L = proportion of basin in main channel lakes (percent)

S = slope of main channel (feet per 1,000 feet)

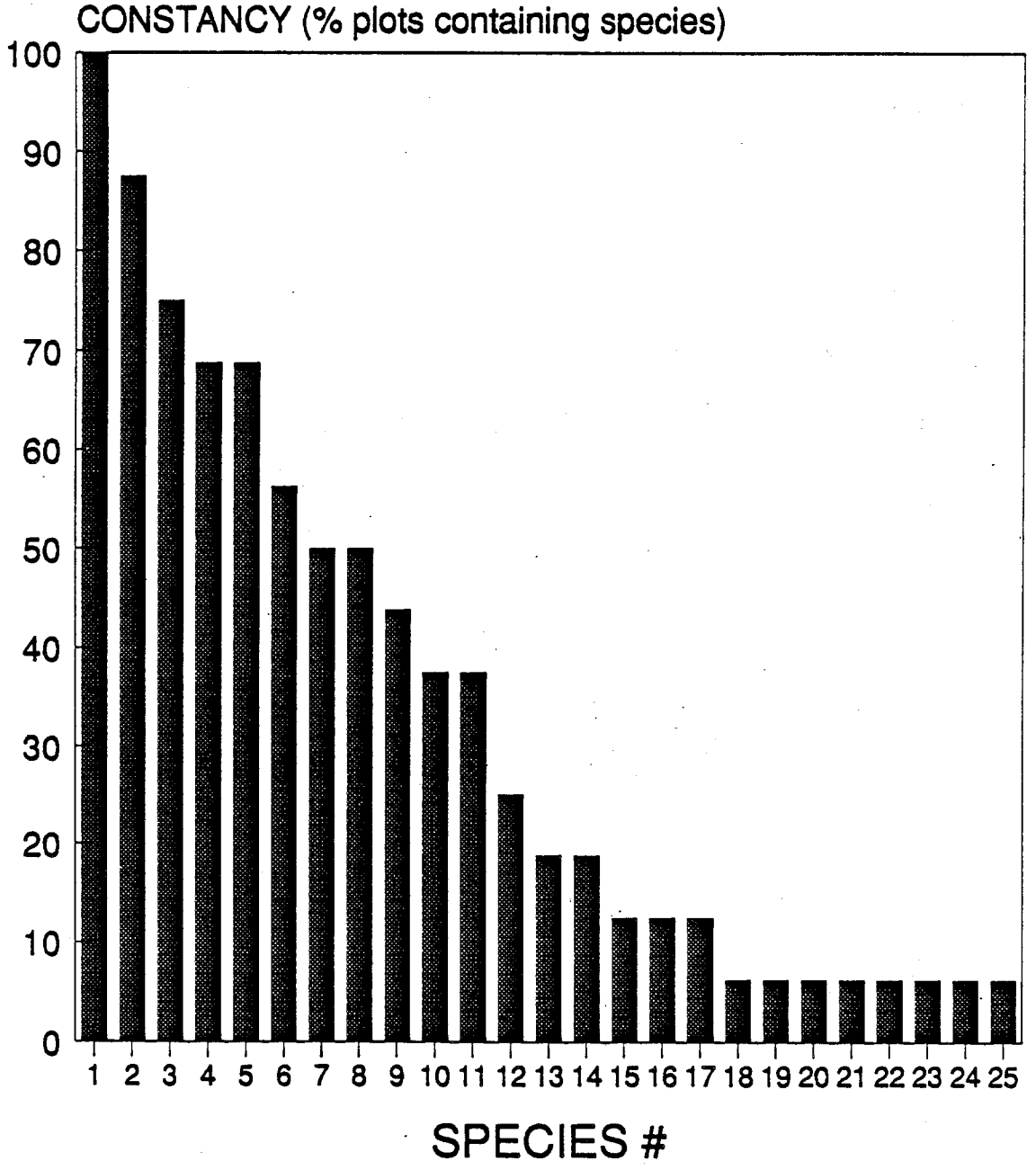
E = mean elevation of basin (feet)

C = south distance to Gulf of Alaska (miles)

RIPARIAN VEGETATION SURVEYS, LTS I - VIII, 1989

At each sample sight a brief visual survey was conducted on the tall shrub/forb layers of plant species occuring within the riparian zone on each side of the channel. There is currently some discussion as to the definition of riparian zones on the Tongass. Because of the abundance of water, and the difficulty in distinguishing between stream-influenced and precipitation-influenced vegetation, it is usually quite difficult to readily determine the boundary of the riparian zone. For the Long Term Sights, the riparian zone was identified as the area beginning immediately adjacent to the channel and extending outward until the tall shrub/forb layer became visibly more homogenous. These plants tend to taper off a short distance from the stream, often within 3 to 15 feet. However, in a large floodplain situation it may be difficult to determine the obvious edge of the riparian zone, which in some cases was extended up to 45 feet. While the presence of the predominant tree species, Sitka Spruce (Picea sitchensis) and tree-sized red alder (Alnus rubra) was noted, no attempt was made to identify the entire Sitka Spruce dominated riparian zone, which would be an undertaking far beyond the scope of these surveys. Instead, attention was focused on the understory species present within the riparian zone on each side of the channel.

Constancy of Riparian Vegetation LTS I - LTS VIII, 1989

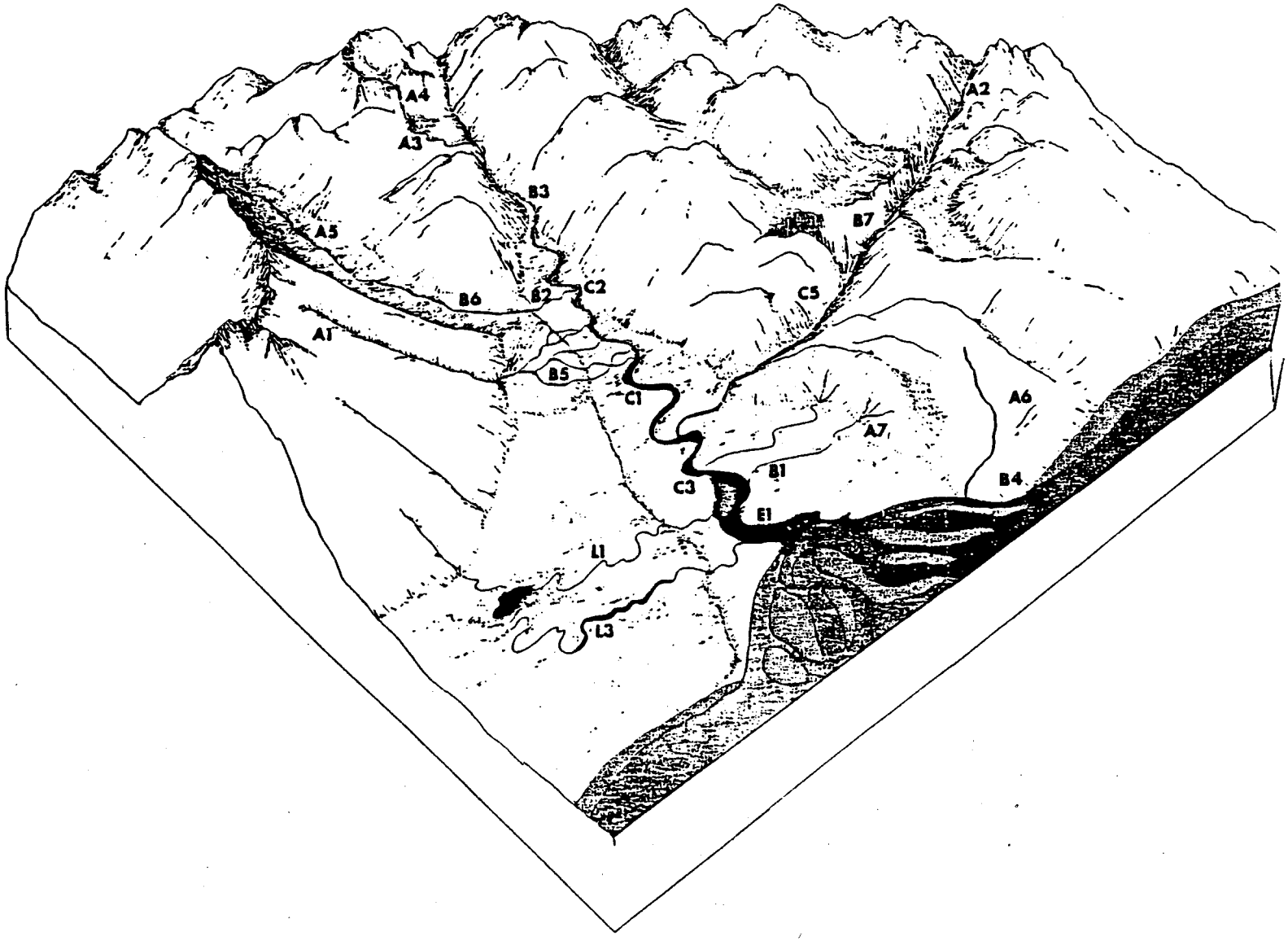


See next page for species.

SPECIES OCCURANCE IN THE RIPARIAN ZONES OF LTS1 - LTS8, 1989

C = Constancy (Percent of plots containing the species)
N = Number of Plots = 16 (8 sites x 2 stream banks/site)

SPECIES NUMBER	COMMON NAME	SCIENTIFIC NAME	# PLOTS FOUND ON	C
1	Sitka spruce	*Picea sitchensis*	16	100
2	Salmonberry	*Rubus spectabilis*	14	87.5
3	Devils Club	*Oplopanax horridum*	12	75.0
4	Lady Fern	*Athyrium filix-femina*	11	68.8
5	Red Alder	*Alnus rubra*	11	68.8
6	Stink Current	*Ribes bracteosum*	9	56.3
7	Rattlesnake Root	*Prenanthes alata*	8	50.0
8	Deer Berry	*Maianthemum dilatatum*	8	50.0
9	Oak Fern	*Gymnocarpium dryopteris*	7	43.8
10	Red Elderberry	*Sambucus racemosa*	6	37.5
11	Enchanters Nightshade	*Circaea alpina*	6	37.5
12	Beech fern	*Thelypteris phegopteris*	4	25.0
13	Foam Flower	*Tiarella trifoliata*	3	18.8
14	Skunk Cabbage	*Lysichitum americanum*	3	18.8
15	Stream Violet	*Viola glabella*	2	12.5
16	Goats Beard	*Aruncus sylvester*	2	12.5
17	Clasping Twisted Stalk	*Streptopus amplexifolius*	2	12.5
18	False Hellibore	*Veratrum viride*	1	6.25
19	Bedstraw	*Galium* sp.	1	6.25
20	Rosy Twisted Stalk	*Streptopus roseus*	1	6.25
21	Highbush Cranberry	*Viburnum edule*	1	6.25
22	Cow Parsnip	*Heracleum lanatum*	1	6.25
23	Red Osier Dogwood	*Cornus stolonifera*	1	6.25
24	Five Leaf Bramble	*Rubus pedatus*	1	6.25
25	Grass	Gramineae	1	6.25



CHANNEL TYPE DISTRIBUTION

FOR A TYPICAL WATERSHED

REVISED 11/01/89, INCORPORATES REVISIONS AGREED TO AT CT CORRELATION MEETING 10/23-27 1989, JUNEAU.

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
A1 - Forested, steep mnt. slope channel	>15% Gradient <15 M Width Single channel C9, C7, C4, C5, C1 B1, A1	Bedrock Transport Br, Bldr, Rubb	Small 30's,40's,10's,51 >10 M; >100% <50 M Incision	Linear channel pattern, Very high gradient, V-notch
A2 - Forested, high grad upper valley channel	6 - 15% Gradient </ 20 M WIDTH Single channel C5,C3,C1,C4, B1.	BR - Mixed Transport BR, Bldr, Rubb	Small - Moderate 30's, 40's >20 M; <100% <50 M Incision	A2 CT's associated w/ upper valley development
A3 - Forested, high gradient alluvial cone channel	>6% @ Midpoint VARIABLE Single - Multiple ALL B'S AND ALL C'S	Alluvial to mixed. Transport/Storage C. Grv. - BLDR	Small - Moderate 52, 51 <2 M </ 4 M Incision	Minimum legnth is 200 M Poor flow containment, no side slope developmt Exclusively assoc. with alluvial cone landform.
A4 - Very high gradient, mountain slope cascade channel	>/ 15 % gradient Variable width Single Channel All C's,A's, B1	BR but may vary Transport BR, Bldr, Rubb	Small 10, 40's, 51,52 <10 M <10 M Incision	Waterfalls & steep cascades very common

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Spacial Mapping Conventions
A5 - Lowland, high grad. incised muskeg channel	6 - 20% Gradient 6 - 15 M Width Single Channel C9, C5, C4	Bedrock Transport BR, Bldr, Rubb	Small - Moderate 60's, 40's, 30 0 - 20 M, >100% 6 - 20 M Incision	May appear in high elev headwaters, abrupt incision, containment excellant
A6 - High grad. shallow - moderate incision lowland, muskeg channel	6 - 15% Gradient </ 10 M Width Single Channel C4	BR - Mixed Transport BR - Rubble	Small - Moderate 60's, 40's, 30 <6 M Side Slope <6 M Incision	Well contained w/ mod - shallow incision
A7 - High grad. shallow footslope channel	6 - 15% Gradient <15 M Width Single Channel C4 or better All B's	BR, may vary Transport Br, Bldr, Rubb	Small - Moderate 51, 52, 40's <10 M Side Slope 1 - 10 M Incision	High grad, forested footslope channel Most often assoc. with footslope 52.
B1 - Small, lowland, low gradient alluvial forest channel	< 2% Gradient <10 M Width Single - Multiple Most C's	Alluvial Depositional Sand - Sm.Rubb	Small - Moderate 53,52,42,a1,a2 Short, shallow </ 2 M Incision	Beaver activity common on the B1 channel

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landform Side Slope Incision	Comments and Special Mapping Conventions
B1.4 - Lowland non-forested low gradient channel	<2% Gradient <10 M Width Single Channel M1, M3	Alluvial Depositional Sand - C. Grv	Small - Moderate 53, 61, 62 Negligible <2 M Incision	B1.4 is a non-forested phase located in open meadows. Similar to L1 w/ sand/gravel bar deve
B1.5 - Forested Yakutat Foreland channel	<2% Gradient <15 M Width Single Channel C1, C3	Alluvial Depositional Sand - F. Grv.	Small - Moderate Yakutat Foreland Negligible <2 M Incision	Vegetation is Sitka spruce//Devils club & Sitka spruce/Devils clu Vaccinium
B1.6 - Non-forested Yakutat Foreland	<2% Gradient <15 M Width Single Channel All B's	Alluvial Depositional Sand - C. Grv.	Small - Moderate Yakutat Foreland	Found on lowland (60's) Alder/willow & Willow/ salmonberry plant assoc
B2 - Forested, moderate gradient, narrow valley channel	2 - 6% Gradient </ 10 M Width Single Channel C4 or better	Alluvial - Mixed Transport - Deposit F.Grv - Sm. Bldr.	Small - Moderate 40, 50, 60 Short, shallow <4 M Incision	Floodplain terrace is at least 1X bankfull Channel is a B2

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradiant Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
B3 - Forested, moderate gradient, upper valley	2 - 6% Gradient >10 M Width Single Channel C4 or better	Alluvial - Mixed Transport Variable	Moderate - Large 40, 50, & 60's Variable <4 M Incision	Variable landform; active floodplain terraces present
B3.4 - High energy upper valley forest channel	2 - 6% Gradient >10 M Width Single Channel B1, A2	Alluvial - Mixed Transport C.Grv. - Rubb., S.Bldr	Moderate - Large 30, 40, 50, 60 Variable <3 M Incision	High energy, upper valley brush channel
B4 - Scrubby, moderate gradient channel	<6% Gradiant <10 M Width Single Channel C5 or poorer	BR - Mixed Transport C.Grv - BR	Small - Mod 61, 62, 40's Short, Shallow <1 4 M Incision	
B5 - Forested, moderate gradiant, alluvial fan channel	1 - <1 6% Gradiant <20 M Width Single - Multiple C1, C3, C5, C6	Alluvial Depositional F.Grv. - Lg.Rubb.	Small 52, 53 Short, Shallow <2 M Incision	B5 is a transitional alluvial fan channel between high gradiant A CT to Valley CT's

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landform Side Slope Incision	Comments and Special Mapping Conventions
B6 - Moderate gradient, lowland muskeg chan.	2 - 6% Gradient <20 M Width Single Channel C4, C5, C8	BR - Mixed Transport C. Grv. - BR	Small - Mod 60, 40, 51 4 - 20 M Side Slope 4 - 20 M Incision	The abruptly incised B6 chan. often follows BR fracture zones and may display linear or rectangular pattern
B7 - Deep gorge channel, brushy, moderate-high gradient	> 4% Gradient <15 M Width Single Channel C9,C7,C6, A1	BR Transport Rubb - BR	Mod - Large 54 >20 M, >70% >10 M Incision	Contains major falls. B7 is an abrupt deeply incised channel w/ very steep side slopes
C1 - Forested, lower valley, low grad channel	</ 2% Gradient 10 - 20 M Width Single - Multiple C1,C3,C5,C6,C9 and D's.	Alluvial Depositional Sand - Rubble	Large 53, all 60's Short - shallow </ 2 M Incision	Floodplain channel. Multiple channels & bar development common

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
C1.1 - Forested low gradient, high energy channel	<2% Gradient 10 -20 M Width Single - Multiple C5, Co, B1, B3, D1, M3	Alluvial Deposition - Transport F. Grv - Lg. Rubble	Large 53 Shallow - Deep	Includes forested & non forest phases.
C1.3 - Kruzof Ash Phase (volcanic ash phase located on Kruzof Island)				
C1.4 - Non-forested Phase of C1 channel; Vegetation is M2, M3 or marginal stringers of C4, C8. Substrate are sandy.				
C1.5 - Yakutat Forelands Glacial Outwash, Forested Phase (old F1 channel) Vegetation consists of Sitka Spruce/Cottonwood/ Willow or Sitka Spruce/Devils Club/Vaccinium plant associations. Substrate is predominately sand and gravel.				
C1.6 - Yakutat Forelands Glacial Outwash, Non-forested Phase (old F2 channel) Vegetation consists of Willow/Sedge, Alder/Willow and Cottonwood/Alder plant associations. Stream gradient is low (<0.5%). Substrates are predominately sand and gravel. Bankfull width averages 13 m.				
C1.8 - Underfit Glacial Phase, associated with flat lowlands and outburst flooplains. C1 and B canopy types compose riparian vegetation.				
C2 - Lower valley or muskeg type landforms; low gradient, incised channel	</ 2% Gradient >10 M Width Single channel C5, C4, C6,	Bedrock - mixed Transport C.Grv - BR	Large - Very Large 40's, 60's Steep, <20 M < 10 M Incision	Meanders cannot exceed 1/2 bankful width Discontinuous 53 landforms can occur
C2.7 - Lower valley, low gradient, incised channel	<2% Gradient >7 M Width Single channel C5, C4, C3, C6, C1	Bedrock Deposition Rubb, Bldr, BR	Large - Very Large 40's, 60's Steep, <20 M Variable	Glide phase of C2
C2.3 - Glacial Moraine Phase, associated with flat lowlands and outburst floodplains, large erratic boulders may be present in substrate, bankfull width averages 26 m.				

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
C3 - Forested, broad, low gradient, lower valley channel	<2% Gradient >20 M Width Single - Multiple C3,C5,C6, All D's.	Alluvial Depositional Sand - Sm. Rubb.	Very Large 53 Flat, Variable </ 2M Incision	
C3.1 - Broad, high energy phase, lower valley channel. Old C4 - incl. forest & non-forested phase	<2% Gradient >20 M Width Single - Braided B1, C3, C6	Alluvial Depositional C. Grv - S. Bldr	Very large 53 Flat, Variable <2 M Incision	Often times occurs where A1 CT's feed directly into low gradient valley bottom channels
C3.3 - Broad, low grad. lower valley, bedrock influenced channel	<2% Gradient >20 M Width Single - Multiple Co, C3	BR influenced Transport F. Grv - BR	Very Large 53 Flat, Variable	BR influenced phase, C2/C3 mix found as channel approaches salt water
C3.4 - broad, placid, low gradient channel	<2% Gradient >20 M Gradient Single Channel C5, C3	Alluvial Depositional F. Grv - Rubb	Very Large 53 Flat, Variable	Non-forested, placid water phase of C3

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
C3.5 - Yakutat Foreland Glacial Outwash Forested Channel (Old F3)				
C3.6 - Yakutat Foreland Glacial Outwash Forested Channel (Old F4)				
C4 - Beach and sand dune channel	<0.5% Gradient >12 M Width Single - Multiple Co, B3	Alluvial Depositional Sand, F. Grv, Silt	Large - Very Large 72 Shallow <2 M Incision	Competing channels: B1.5 & L1
C4.4 - Non-forested Phase (Old G6)				
C5 - Confined narrow valley, forested channel	</ 5% Gradient 10 - 30 M Width Single channel C5,C4,C3	Bedrock-mixed Transport - Deposition C.Grv.- BR	Large - Very Large 30's, 51,54, 61, 40'S >20 M, <70% Variable Incision	Channel occurs within narrow confining valley Varied incision.
L1 - Low gradient, lowland muskeg channel with ponds or placid flow	<2% Gradient <10 M Width Single channel M1,M2,M3, B3	Alluvial Depositional Muck, Sand	Small 60's, 40's, 53 Flat, negligible </ 2 M Incision	Assoc. w/53 's in broad river valley affected by wide range in river stage

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
L1.4 - Scrub forest phase, lowland, low gradient, muskeg channel	<2% Gradient <10 M Width Single M1, M3, C4	Alluvial Depositional Muck, Sand	Small 60's, 40's Flat, negligible <2 M Incision	Canopy is scrubby and in narrow bands
L2 - Wide, low gradient deep water, muskeg channel	0 - 1% gradient >10 M Width Single channel All B's and M's	Alluvial Depositional Muck, Sand	Large - Very Large 60's, 53, Nonglacial Flat, negligible </ 2 M Incision	Commonly associated with lake outlet or meadow area
L3 - Stable beaver dam, pond chain complex	<1% Gradient Variable Single channel B1,B2, C3,C4,C6, M3	Alluvial Depositional Muck - F.Grv.	Small 60's, 40's, 53 Flat, variable </ 2 M Incisio	Series of beaver ponds, often recognized on the aerial photo by a stand of dead trees
THIS CI HAS BEEN REVISED SEE NEW DESCRIPTION BELOW				
L4 - Glacial floodplain cut-off slough channel	<1% Gradient Variable Multiple - Braided Variable veg.	Alluvial Depositional Muck - Rubb.	Small 53, 64, Flat, negligible </ 4 M Incisio	Mapped as connected side channels of lower valley glacial channels Active floodplain

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
THIS CT HAS BEEN REVISED SEE NEW DESCRIPTION BELOW				
L5 - Glacier floodplain backwater slough channel	<0.5% Gradient Variable Width Single channel Variable veg.	Alluvial Depositional Sand, mud	Small 53, 64,62 Flat, negligible <5 M incision	Floodplain backwater channel floodplain Main channel dominates flow regime in channel
Provisional Comment: May be found in glacial estuarine areas.				
E1 - Small substrate, large estuarine channel	</ 2% Gradient >10 M Width Single - Multiple E2, E3	Alluvial Depositional Sand - Rubb.	Large - Very Large 71 Flat, variable Shallow, 0 - 5M Incision	Width > 10 M at upstream boundary.
E1.3 - Large substrate large esturine channel	0 to 2% Gradient >10 M Width Single - Multiple E2, E3	Alluvial, mixed Depositional C.Grv. - Sm.Bldr.	Large - Very Large 71 Flat, variable Shallow, 0 - 5M Incision	Large substrate phase, typically no sedge/ grass area associated
E1.o - Beach and dune estuarine channel (old E4 channel)	<1% Gradient >10 M Width Single - Multiple E2, E3	Alluvial Depositional Sand	Large - Very Large 72, 74 Flat, variable	Outer coastal area w/ sand and dune (22) and and upliftad beach (74) landforms

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landform Side Slope Incision	Comments and Special Mapping Conventions
E2 - Small rocky estuarine channel	0 to 3% Gradient <10 M Width Single Channel E2, E3	Alluvial, mixed Depositional C.Grv. - Bldr	Moderate - Large 71 Variable Shallow, <3 M	Width <10 M measured at upstream boundary, may be > 10 M depending on channel spreading through lower potion of estuary.
E3 - Narrow, small substrate, estuarine channel	</ 1% Gradient <10 M Width Single channel E2, E3	Alluvial Depositional Sand - Sm.Rubb	Moderate - Large 71 Flat, negligible Shallow, <3M Icision	Better quality habitat than the E2 channel Width <10 M at upstream end may be >10 M due to spreading as noted with the E2.
E5 - Broad braided glacial estuarine channel	<2% Gradient >20 M Width Multiple channel E1, E2, E3	Alluvial Depositional Sand	Moderate - Large 71 Shallow-Flat, variable Shallow, <3 M Incision	15% or greater of basin area covered by alpine glaciers or permanent snow fields
O1 - Low gradient cirque basin channel	<3% Gradient Width Variable Single - Braided A1, A2, B1	Alluvial Transport Sand- Sm.Bldr	Small 30's, o1 Shallow, Variable </ 2 M Incision	15% or greater of basin area covered by alpine glaciers or permanent snowfields.

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landfrom Side Slope Incision	Comments and Special Mapping Conventions
D2 - Upper valley glacial torrent channel	>6% Gradient 6 - 15 M Width Single channel A's, B's, C4,C5,C7 D1,D2	Variable Transport Rubb - BR	Small - Moderate 10's, 30's, 51,52 Variable Variable	15% or greater of basin area covered by alpine glaciers or permanent snowfields
D3 - Moderate gradient, upper valley gradient channel	2 - 6% Gradient Variable Width Single - Braided A's, B's, C6, D's	Alluvial - mixed Transport C.Grv. - Sm.Bldr. 	Moderate 53, >2 Shallow, Variable </ 4M Incision	15% or greater of basin area covered by alpine glaciers or permanent snow fields
D4 - Broad low gradient meandering glacial channel	<3% Gradient Variable Width Single - Multiple B1, C4,C5,C6,C9, D's	Alluvial, contained Depositional C. Grv - Sm.Bl 	Large - Very Large 53, Glacial, 61,62 Shallow, Variable </ 4M Incision	15% or greater of basin area covered by alpine glaciers or permanent snow fields
D5 - Broad, braided lower valley low gradient glacial channel	<3% Gradient >20 M Width Braided Channel B1, D1, D2, C0 or no veg.	Alluvial Depositional Sand - Lg.Rubble 	Large - Very Large 53, 64 Shallow Side Slope </ 2M Incision	15% or greater of basin area covered by alpine glaciers or permanent snow fields

SUMMARY OF THE DIFFERENTIA USED TO MAP TONGASS NATIONAL FOREST CHANNEL TYPES

Channel Type Description	Gradient Width Pattern Vegetation	Control Process Substrate	Basin Area Landform Side Slope Incision	Comments and Special Mapping Conventions
D6 - High gradient, glacial alluvial fan/cone channel	Variable Gradient Variable Width Single - Multiple A's, B's, C6	Alluvial Transport C.Grv.- BR	Small - Moderate 52, 51 - Fan/cone Shallow Side Slope </ 2M Incision	15% or greater of basin area covered by alpine glaciers or permanent snowfields
D7 - Confined, high gradient (cascade) glacial channel	5 - 10% Gradient 20 - 30 M width Single channel B2, C1,C7	Bedrock Transport Rubble to bedrock	Large 30's, 40's, 52, 54 Steep Side Slope >/ 16M Incision	Mid to lower valley position; cascades and short falls readily vis.

POLYGONS

R - See D5				Perimeter of active D5 channel must be wider than xxxx feet to use polygon
L - Lake				Lake must be 5 acres or larger to be mapped
M - Marine deposition zone				Marine zone must be 10 acres or larger to be mapped

Revised channel type descriptions for the L4, L5, D8 and E4 cts. REVISED DEC 1989.

CHANNEL TYPE DESCRIPTION	GRADIENT WIDTH PATTERN VEGETATION	CONTROL PROCESS SUBSTRATE	BASIN AREA LANDFORM SIDE SLOPE INCISION	COMMENTS and SPECIAL MAPPING CONVENTIONS
D8 - GLACIAL SIDECHANNEL	</ 1.0% VARIABLE SINGLE TO MULTIPLE VARIABLE (M1,B1,B2,D1) (D2, C3,C4)	ALLUVIAL DEPOSITIONAL SILT - RUBBLE	LARGE TO VERY LARGE 53, 62, 64 SHALLOW TO FLAT </ 4 M	Usually associated with D5 riverines, upper width limit is < 200M, 0.5 in. on photos, 0.25 in. base maps. Formely called L4 CT.

MAPPING REVISION NOTE: Chatham Area mainland L4's and Stikine Area L4's as mapped pre-DECEMBER 1989, will have to be revised to the D8 ct.

L5 - DEEP UPLAND SLOUGH	</ 0.5% VARIABLE SINGLE VARIABLE (B1,B2,C6) (D1,D2,M1,M2)	ALLUVIAL DEPOSITIONAL SILT/CLAY - FINE GRVL	LARGE TO VERY LARGE 53, 62, 64 </ 4 M	Often associated with uplifted mudflats and glacial river terraces. Clear water flow, deep rectangular x-section profile.

N.B. THE L5 IS A VERY LOW GRADIENT CHANNEL WITH SLUGGISH LAMINAR FLOW. GLACIAL SILT WATER FROM ADJACENT GLACIAL CHANNELS MAY INUNDATE THE LOWER PORTION OF THE L5 (i.e. at the interface of the L5 and the main river). THESE CHANNELS ARE DEEP SLOUGH GREATER THAN 3 FT. FOR BANKFULL DEPTH. BANKS ARE OFTEN COMPOSED OF SILT AND CLAY.

MAP REVISION NOTE: Convert Chatham Area B8 to L5, Chatham Area mainland and Situk L5's will remain as is.

L4 - SHALLOW GROUNDWATER FED SLOUGH	<1% GRADIENT VARIABLE MULTIPLE - BRAIDED VARIABLE VEG. TYPES	ALLUVIAL DEPOSITIONAL SILT - RUBBLE	VARIABLE 53, 64, 62 FLAT, NEGLIGIBLE </ 4M INCISION	Occupy relic glacial outwash channels, can be connected to main river, normally < 3 feet deep (bankfull).

N.B. THIS IS A NEW DESCRIPTION FOR THE L4, GROUNDWATER RECHARGE IS DOMINANT IN THESE SLOUGHS.

E4 - SILTY ESTUARY CHANNEL OR SLOUGH	< 1% GRADIENT < 20 M SINGLE E2, E3	ALLUVIAL DEPOSITIONAL SILT/CLAY - VFG/SAND	VARIABLE 71, 72 SHORT STEEP </ 4 M INCISION	May lie in proximity to large glacial E5 ct or M zones. High degree of sinuosity is normal.

CHANNEL TYPE VERIFICATION PROCEDURES

Field verification consists of sampling representative areas of a given channel type segment for the taxonomic unit differentia. The primary purpose of this sampling is to verify that channel type mapping, based on aerial photographic interpretation, is accurate. The secondary purpose of field verification is to characterize key physical features of channel type classification units by field data on representative stream segments. These data will help define class limits for channel type units.

Site selection: All verification sampling is performed using "representative" sites to characterize the physical properties of an entire channel type segment (hereafter referred to as "segment"). The term "site" refers to a short channel area which is a representative subset of the entire segment, and which is used as the sampling unit. The representative sample site is a channel area which has physical features that occur most frequently for the segment being sampled. These features, which are present or absent within the segment as a whole, have the same occurrence frequency in the site. The predominant range in physical dimensions that occurs for key features throughout the segment also occurs in a similar manner within the site. This site also demonstrates the same spatial patterns of features which occur over the entire segment. The site is not necessarily uniform in its physical characteristics. Rather, the variation in these characteristics occurs in an amount and pattern similar to that of the entire segment.

The representativeness of each site is determined before any data collection occurs. Sites which have been extensively disturbed by road construction, mining, recreation, or other developments are not to be sampled. Sites that are to be sampled which occur downstream of such developments should be noted as such on the data card. Site representativeness is first assessed by selecting "potential" sampling sites in the office prior to field work. In the field, each potential site is assessed by conducting a brief ground survey of several hundred meters of the segment to determine how well the potential site represents the segment. Only after site representativeness has been confirmed, does sampling begin.

The length of each sample site is to be the shorter distance of the following: 1) a two pool/riffle sequence; 2) 50 meters long if the channel bankfull width is less than 10 meters; or 3) 100 meters long if the channel bankfull width is greater than 10 meters. Sampling is to only occur at low flow stage, which is one-third or less of the bankfull stage.

Date:	Record as a six digit number using a year-month-day format
VCU:	Record the three digit VCU number
Segment:	Record the three digit number
Site:	Record the Long Term Site Number

Area: Record the standard Area number:
Stikine Area - 02
Chatham Area - 03
Ketchikan Area - 05

1988 Amendment:
Ranger District: Record the standard Ranger District number.

Petersburg - 010	Sitka - 010	Craig - 010
Wrangell - 020	Hoonah - 020	Ketchikan - 020
	Juneau - 030	Thorne Bay - 040
	Admiralty NM - 040**	

Management Area: Record the standard three character TLMP Management Area label

Subsection: Record the two digit subsection number (from the watershed field map)

Quarter-Quad: Record the name of the USGS quarter-quadrangle which covers the sample site. The name should be the same as that at the bottom right hand side of the USGS quad.

Stream Name: Record the stream name for the drainage basin containing the sample site.

ADF&G Number: Record the ADF&G number for the stream segment as it appears in the ADF&G Anadromous Waters Catalog.

Aerial Photograph: Record the year, flight line number, roll number, and photo number of the aerial photograph covering the site. The flight year is the last two digits of the year (1984 = 84). The line number is an alphanumeric two character label. The roll and photo numbers are one and three digit numbers, respectively.

Camera Photo: Record the three digit upstream and downstream film roll number. To establish the roll number take one or two pictures of a sheet of paper with the roll identification number printed on it. The roll identification number is increased sequentially for each new roll of film.

Record the two digit number of the upstream and downstream sample site photographs taken in the appropriate space. The number is taken from the camera counter.

Preliminary Channel Type: Record the channel type assigned during premapping to the segment being sampled (taken from the aerial photo).

Final Channel Type: Record the final channel type (determined after field verification and final correlation).

Water Temperature: Record the water temperature in degrees celsius.

Air Temperature: Record the air temperature in degrees celsius.

Weather: Identify the weather conditions during the verification (for example, rain, sun).

Time: Record the time of day the sample was taken.

Adjacent Landform: Record the predominant landform for both the left and right banks over a minimum of 10 acres (except as noted below). If more than one distinct landform occurs along the site bank, record the landform occupying the greatest length of the site. Landforms are delineated using the R-10 Landform Legend. In the office, they are determined from the aerial photograph with the mapping box containing the site. To determining the 10 acre size on an aerial photo, consider an area contained within an imaginary rectangle in which the channel is one of the short sides and one of the long sides extends away from the channel a distance sufficient to contain 10 acres (0.25 inch by 1.0 inch area on 1:15,840 aerial photos). Landforms are verified in the field by observing landform slope, relief, dissection, and landscape position characteristics.

The only exception to the 10 acre minimum size rule is when an alluvial floodplain or river terrace occurs directly adjacent to the channel. If the floodplain or river terrace averages greater that 30 feet (10 meters) in width, and is continuous along the bank, then record the respective landform as a floodplain. If the floodplain or river terrace is discontinuous, or averages less than 30 feet in width along the bank, note its presence in the "Comments," but ignore its presence for landform identification and consider the 10 acre area extending above the floodplain or river terrace.

Canopy Type: Record the predominant canopy type for both the left and right banks over a minimum of 5 acres. If more than one distinct canopy type occurs along a site, record the canopy type occupying the greatest length of the site. Canopy types are identified using the Tongass National Forest - Chatham Area Canopy Type Legend. The canopy type is determined in the office from the aerial photograph having the effective area containing the site. It is verified in the field by observing canopy crown closure, species composition, and site productivity characteristics.

Plant Associations and Vegetation: Record the predominant Plant Association (PA) or vegetation species occurring on the left and right banks, respectively. These classifications or identifications are made while doing the sideslope angle. Record the

numeric code (see below), the percent of coverage each code provides, and the distance that community extends. The vegetative transect length is the same as that for side slope, 200'.

If the vegetation community is not an identified plant association, then record the predominant overstory, understory, and groundcover vegetation species using the appropriate numeric codes (see "Vegetation Codes for Nonforest Plant Associations"). For each species, record the following:

Specie: record the specie code.

Cover: record the canopy coverage in percent.

The subsequent columns are used to record any additional vegetation community breaks in the same fashion along the 200 foot transect. Record the distance from the channel where the breaks occur. If the vegetative community does not change between the stream and 200 feet of it, then record 200 feet as the distance under PA #1

Site Disturbed:

Record whether the site has been disturbed by management activities or catastrophic natural processes. "YES" is circled if a site has one or more of the following characteristics:

a. Any obvious tree falling (selection cutting or clearcutting) has occurred within 100 feet on at least one side of the channel either immediately adjacent to or immediately upstream of the site.

b. More than 25 percent of the upstream basin area is covered by second growth vegetation less than 30 years old.

c. Blowdown or mass erosion affects more than 30 percent of the entire segment. Upper bank sliding and debris torrents in headwater or tributary channels also qualify as site disturbance and should be noted.

If "YES" is circled, note in the COMMENTS what type of disturbance occurs.

Sideslope Length and Angle:

Record the adjacent sideslope distances and angles for each stream bank, RIGHT and LEFT, along a 200 foot transect laid out perpendicular to the channel banks. Slope distances and angles are recorded along the transect at each significant change in slope. Slope distances are recorded opposite RIGHT and LEFT DISTANCE

and slope angles opposite "ANGLE." Slopes may be recorded as either positive or negative, no sign will be assumed to be plus, an upward slope.

Trap Results: Minnow traps, baited with fish eggs, are set for a minimum of 30 minutes. When the site sample is completed, the fish are enumerated by species, and recorded by catch per trap.

Stream Gradient: Record the stream gradient. Gradient is measured over at least two pool/riffle (or glide/riffle) sequences.

The sampler stands at the water's edge and flags their eye height on a piece of overhanging vegetation. They then walk as far down the site as possible, keeping the flagging visible, and stand at the water's edge. The gradient is determined by sighting on the flagging with the clinometer while standing straight. This number is recorded to the nearest 0.5 percent.

Incision Depth: Record the appropriate incision depth class separately for each bank. The incision depth is the distance between the channel bottom and the top of the upper bank. In entranched channels, the streambank and the valley wall may coincide. Estimate a representative section of each bank using a range finder.

Substrate: Record the percentages of the substrate size classes opposite their respective names. Percentages should be totaled to check for possible calculation errors.

Channel Pattern: Record the relative proportion of channel patterns occurring over the entire sampling site length.

a. Single: Channels having one single channelway with a single thalweg that generally parallels the banks. Side channels or overflow areas cover less than 10 percent of the site bankfull width.

b. Multiple: Channels having more than one channelway or flow path occurring within the bankfull area which cover greater than 10 percent of the site bankfull width. These channels still have a single thalweg over most of their length, but the thalweg often has shorter meander wavelengths than the bankfull channel meander wavelength.

c. Braided: Channels having numerous flowpaths, discontinuous thalweg, and extensive bar and riffle development.

Bank Control: Choose a streambank composition which best typifies the entire segment. These are:

a. Bedrock: channels contained within rock walls or with extensive outcropping along the banks and bed (greater than 15 percent of the channel length).

b. Mixed: Channels contained within a mixture of colluvial, alluvial, and bedrock materials with consistent, but not extensive, bedrock occurrence within the banks or bed (2-15 percent of the channel length).

c. Alluvium: Channels cut into alluvium with only very infrequent bedrock occurrence in the banks and bed (less than two percent of the channel length).

Stream Geometry: Stream geometry measurements are taken along a cross-section that is located at a straight section of the site and that is representative of the widths and depths occurring within the site. Locate it away from local constrictions such as large woody debris accumulations, bedrock constrictions, or large boulder accumulations. If the above mentioned conditions cannot be located, notes to that effect should be recorded in the comment section.

Distinctive high water marks such as consistent exposures or raw bank material, significant breaks in slope on the banks and change from presence to absence of hydrophytic or disturbance vegetation are used to distinguish the mean annual high water level.

Bankfull Width and Depth. Record the bankfull width and depth. Bankfull width and depths are measured using a 100 ft. tape measure and a stadia rod.

Active Width: Active width is the width of the channel which contains water at the time of sampling.

Available Spawning Area (ASA): Record the percent of the active surface area which is ASA. This is a visual estimate that is made to the nearest 5%. Only "good" quality or better ASA is included in this estimate (do not include marginal habitat).

ASA is that area of the stream bottom used by the fish to spawn. A hard and fast definition of gravel sizes or water velocities that go together to qualify as spawning gravel is not possible. Depending on what a stream has to offer, different gravel sizes and water velocities may be used as spawning gravels.

Size and Shape - Ideally, gravels should be well rounded and approximately 1.0 to 6.0 inches in diameter. However, the size of fish using the gravels must be considered. Small resident trout may prefer to spawn in gravels less than 1.0 inch in diameter, while large king salmon can successfully work gravels 8.0 to 10.0 inches in diameter. If the gravels are open enough, the eggs may settle into them without necessity of the fish moving the gravel.

Fine Sediment Content - Spawning gravels should contain little fine materials (less than 2.0 mm in size). When gravels with low fine content are dug into, the water passing over the site clears rapidly if it has been discolored by the digging. Gravels containing much fine material discolor the water when they are moved by a foot or shovel. In these areas, the water often takes several seconds to clear to its normal state, even in rapidly flowing areas.

Compaction - Spawning gravels are easily moved when field personnel walk on them. Gravels may be compacted due to shape (angular, flat, not rounded) or sedimentation (fines fill in interstices and form "solid" mass). Gravels that move very little when walked on and are hard to dig by hand are obviously difficult for salmonids to construct redds in, and often do not allow sufficient water to pass through the gravel interstices to permit good egg and alevin survival.

Water Flow - Intragravel water flows are only guessed at by field personnel looking at surface water flows, gravel fine content, and gravel compaction. Compacted gravels with large amounts of fines probably have very poor intragravel water flows, likewise gravels located at the bottom of a large deep pool. Conversely, areas with loose, easily worked gravel with little fine material in fast flowing sections of a stream probably have excellent intragravel water flows.

Available Rearing Area ARA:

Record the percent of the active surface area which is ARA. This is a visual estimate that is made to the nearest 5%.

Rearing area is that portion of the active stream channel that contains adequate food and cover for sustaining juvenile salmonids. Good rearing area is most often identified by the presence of low flow velocities and significant amounts of cover such as undercut banks and large stable organic debris, and deepwater areas that juvenile salmonids can overwinter in. Proximity to riffle areas generally assumed to be food producing areas

should also be considered. A shallow water, gravel bottom riffle with little instream cover (remember: depth is cover) exemplifies poor rearing habitat if it is not associated with areas that provide cover.

Record the percent of the active surface area which is pools. This is a visual estimate that is made to the nearest 5%.

A pool is a portion of the active stream channel with water deeper than that within the surrounding areas, and often with reduced current velocity, which is frequently usable by fish for resting and cover. Generally, the water surface gradient is lower (i.e. flatter) over the pool than that of the surrounding water area. The channel bottom at the downstream end of the pool is marked by a negative (i.e. upslope) gradient (Wester Division, American Fisheries Society,. 1985, Bayha and Gabreirsen, 1979).

Mean Pool Depth (P. Depth): Record the mean depth for all pools in the sample site. Use the same measurement units (i.e., feet or meters) used for STREAM GEOMETRY. Record this value to the nearest 0.1 m or 0.1 ft, as appropriate. This measurement is made by determining the mean depth for all pools in the sample site, and then determining the overall mean from these separate means.

Transect Distance: Record the length of the sample site in feet.

Average Key Piece Diameter: Record the modal diameter of the LOD key piece in inches. This size is determined by noting the diameter size class in the LOD Tally which has the greatest number of circled tally marks (see below for explanation).

Average Key Piece Length: Record the modal length of the LOD key piece in feet. This size is determined by noting the length size class in the LOD Tally which has the greatest number for circled tally marks (see below for explanation)

The LOD tally is a transect count of all large organic debris within the bankfull width of the channel. The transect is conducted over the entire site. The LOD is tallied by average diameter and total length of each piece. Minimum size tallied is 4 inches by 10 feet in length unless it has a root wad attached. Clump association types are defined as follows:

"A": Single piece of LOD

"B": Loose association of debris, independent of the

number of pieces, in which the pieces are not colinear in orientation or tightly packed and cemented together by smaller debris.

"C": Debris jam consisting of multiple pieces, generally colinear in orientation, which are usually cemented together by small debris.

"E": Any piece with a root wad attached in which the root wad is acting to anchor or stabilize the debris piece in the channel. If the root wad is not effective in stabilizing the piece, it is not considered an "E" type.

COMMENTS: Record any significant conditions or factors which may affect the data collected, or its interpretation. Observations to be noted include: high rainfall, rising water stage, extensive sedimentation or erosion, extensive blowdown or mass erosion, presence of anadromous fish, presence of possible fish passage barriers, land use conditions other than undisturbed, glacial till exposed in banks or bed, marine sediments exposed in banks or bed, beaver activity.

FOREST PLANT ASSOCIATIONS

100	TSHE Series	Tsuga heterophylla	Western hemlock
110	TSHE/VACCI	/Vaccinium spp.	/blueberry
120	TSHE/VACCI/DRAU	/Vaccinium spp.	/blueberry
		/Dryopteris austriaca	/spinulose shield-fern
130	TSHE/VACCI/LYAM	/Vaccinium spp.	/blueberry
		/Lysichitum americanum	/skunk cabbage
140	TSHE/VACCI-OPHO (HP)	/Vaccinium spp.	/blueberry
		/Oplopanax horridium	/devil's club
150	TSHE/VACCI-OPHO (MP)	/Vaccinium spp.	/blueberry
		/Oplopanax horridium	/devil's club
160	TSHE/OPHO	/Oplopanax horridium	/devil's club
170	TSHE/OPHO/LYAM	/Oplopanax horridium	/devil's club
		/Lysichitum americanum	/skunk cabbage
180	TSHE/OPHO/POMU	Oplopanax horridum/	/devil's club
		Polystichum munitum	sword fern
190	TSHE/VACCI/POMU	Vaccinium spp.	blueberry
		Polystichum munitum	sword fern

200	TSHE-CHNO Series	Tsuga heterophylla -Chamecyparis nootkatensis	Western hemlock -Alaska cedar
210	TSHE-CHNO/VACCI	/Vaccinium spp.	/blueberry
220	TSHE-CHNO/VACCI/LYAM	/Vaccinium spp.	/blueberry
		/Lysichitum americanum	/skunk cabbage
250	TSHE-CHNO/VACC-OPHO	/Vaccinium spp	/blueberry
		/Oplopanax horridum	/devilsclub

300	PTST Series	Picea sitchensis	Sitka spruce
305	PISI/MYGA/CAREX	/Myrica gale/Carex	/sweet gale/ sedge
310	PISI/VACCI	/Vaccinium spp.	/blueberry
315	PISI/SALIX	/Salix	/willow
320	PISI/VACCI-OPHO	/Vaccinium spp.	/blueberry
		/Oplopanax horridium	-devil's club
325	PISI/VACCI-SALIX	/Vaccinium spp.	/blueberry
		-Salix spp.	-willow
330	PISI/OPHO	/Oplopanax	/devil's club
340	PISI/OPHO/LYAM	/Oplopanax horridium	/devil's club
		/Lysichitum americanum	/skunk cabbage
350	PISI/ALNUS	/Alnus spp.	/alder
360	PISI/CANU	/Calamagrostis nutkaensis	/Pacific reedgrass
370	PISI/VACCI/LYAM	/Vaccinium/	/blueberry
		Lysichitum americanum	/skunk cabbage
380	PISI/RUSP	Rubus spectabilis	/salmonberry
390	PISI/MOSS	Moss spp.	moss

400	MIXED CONIFER Series	Mixed Conifer	Mixed Conifer
410	MXD CON/VACCI	/Vaccinium spp.	/blueberry
420	MXD CON/VACCI/LYAM	/Vaccinium spp.	/blueberry
		/Lysichitum americanum	/skunk cabbage
430	MXD CON/VACCI/FACR	/Vaccinium spp.	/blueberry
		/Fauria crista-galli	/deer cabbage
440	MXD CON/LYAM-ATFI	/Lysichitum americanum	/skunk cabbage
		-Athyrium filix-femina	-lady fern
450	MXD CON/GASH/FACR	/Gaultheria shallon	/salal
		/Fauria crista-galli	/deer cabbage
460	MXD CON/VACCI-GASH	/Vaccinium spp	/blueberry
		/Gaultheria shallon	/salal
470	MXD CON/GASH/LYAM	/Gaultheria shallon	/salal
		/Lysichitum americanum	/skunk cabbage
480	MXD CON/GASH	/Gaultheria shallon	/salal

500	TSME Series	Tsuga heterophylla	Mountain hemlock
510	TSME/VACCI	/Vaccinium spp.	/blueberry
520	TSME/VACCI-CLPY	/Vaccinium spp.	/blueberry
		-Cladothamnus pyrolaeflorus	-copper bush
530	TSME/VACCI-CAME	/Vaccinium spp.	/blueberry
		-Cassiope mertensiana	-Mertens cassiope
540	TSME/VACCI/VEVI	/Vaccinium spp.	/blueberry
		/Veratrum viride	/false hellebore

600	PICO Series	Pinus contorta	Shore Pine
610	PICO/EMNI	/Empetrum nigrum	/crowberry

700	TSHE-THPL Series	Tsuga heterophylla-Thuja plicata	
710	TSHE-THPL/VACCI	/Vaccinium spp	/blueberry
720	TSHE-THPL/POMU	/Polystichum munitum	/swordfern
730	TSHE-THPL/VACCI/LYAM	/Vaccinium spp	/blueberry
		/Lysichitum americanum	/skunk cabbage
740	TSHE-THPL/OPHO/POMU	/Oplopanax horridum	/devilsclub
		/Polystichum munitum	/swordfern
750	TSHE-THPL/VACCI-OPHO	/Vaccinium spp	/blueberry
		/Oplopanax horridum	/devilsclub
760	TSHE-THPL/VACCI-GASH	/Vaccinium spp	/blueberry
		/Gaultheria shallon	/salal
770	TSHE-THPL/GASH-LYAM	/Gaultheria shallon	/salal
		/Lysichitum americanum	/skunk cabbage
780	TSHE-THPL/GASH	/Gaultheria shallon	/salal
790	TSHE-THPL/OPHO/LYAM	/Oplopanax horridum	/devilsclub
		/Lysichitum americanum	/skunk cabbage

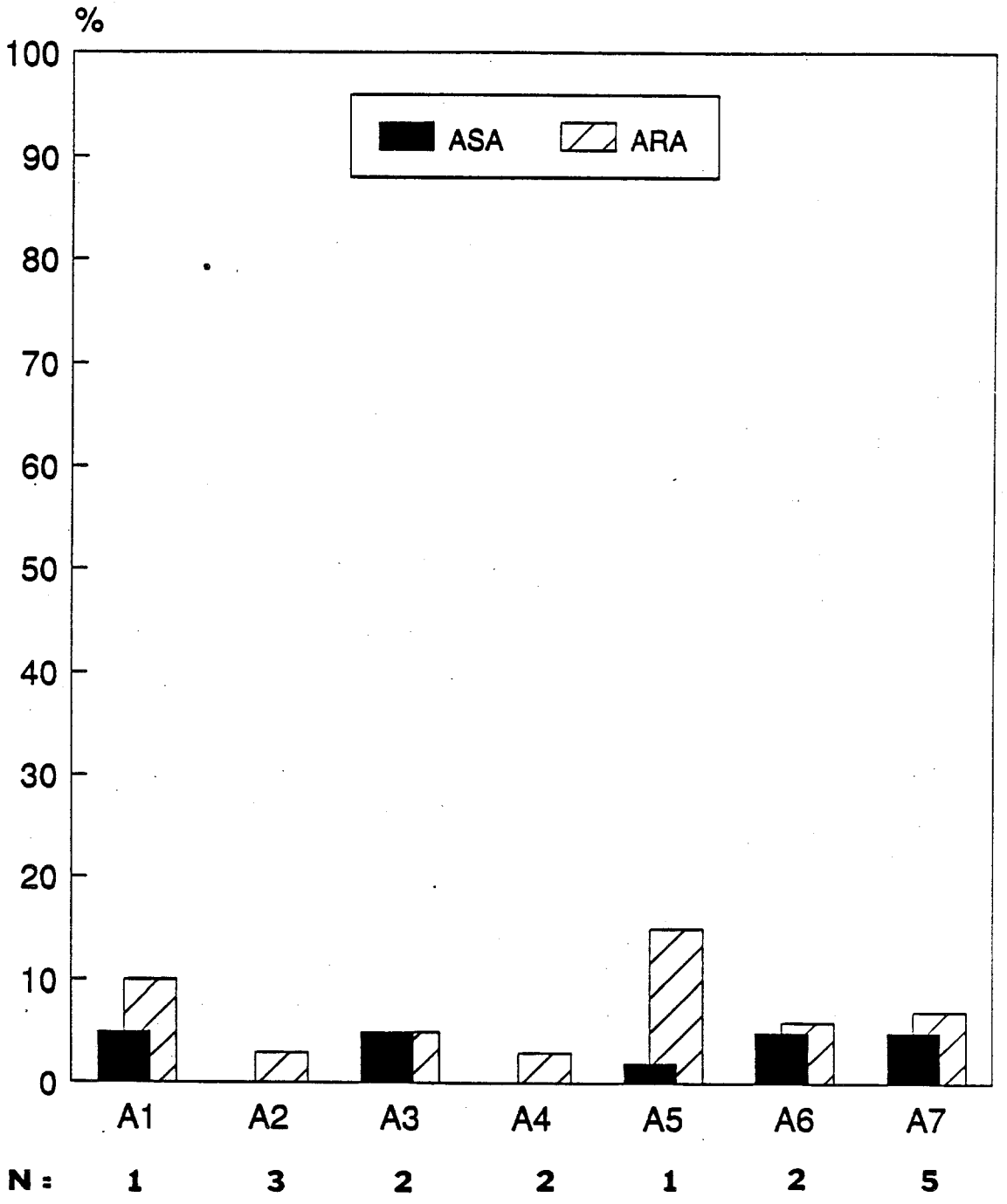
800	PISI-POTR Series	Picea sitchensis-Populus trichocarpa	
810	PISI-POTR/ALNUS	/Alnus spp.	/alder
820	PISI-POTR/SALIX	/Salix spp.	/willow
830	PISI-POTR/OPHO	/Oplopanax horridum	/devil's club
840	PISI-POTR/ALNUS/OPHO	/Alnus spp.	/alder
		/Oplopanax horridum	/devil's club
850	PISI-POTR/VACCI-OPHO	/Vaccinium spp.	/blueberry
		-Oplopanax horridum	-devil's club

VEGETATION CODES FOR NONFOREST PLANT ASSOCIATIONS

ABBREVIATION	CODE	GENUS AND SPECIES	COMMON NAME
		OVERSTORY	
ALRU	01	ALNUS RUBRA	RED ALDER
		UNDERSTORY	
ALSI	25	ALNUS SINUATA	SITKA ALDER
CLPY	40	CLADOTHAMNUS PYROLAEFLORUS	COPPERBUSH
COST	05	CORNUS STOLONIFERA	RED OSIER DOGWOOD
LUPE	10	LUETKEA PECTINATA	LUETKEA
MEFE	55	MENZIESIA FERRUGINEA	RUSTY MENZIESIA
OPHO	45	OPLOPANAX HORRIDUM	DEVIL'S CLUB
RI	60	RIBES _____	CURRANT/GOOSEBERRY
RUPA	03	RUBUS PARVIFLORUS	THIMBLE BERRY
RUSP	35	RUBUS SPECTABILIS	SALMONBERRY
SALIX	20	SALIX SPP.	WILLOW
SARA	07	SAMBUCUS RACEMOSA	RED ELDERBERRY
VACCI	50	VACCINIUM OVAL./ALASKEN.	BLUEBERRY
VAPA	02	VACCINIUM PARVIFOLIUM	RED HUCKLEBERRY
VIED	04	VIBURNUM EDULE	HIGH BUSH CRANBERRY
		GRASS/FORB LAYER	
ATFI	51	ATHYRIUM FILIX-FEMINA	LADY FERN
ARNIC	52	ARNICA SPP.	ARNICA
CABI	53	CALTHA BIFLORA	MARSH MARIGOLD
CIAL	54	CIRCAEA ALPINA	ENCHANTER'S NIGHTSHADE
CLUN	93	CLINTONIA UNIFLORA	BLUE-BEAD
COTR2	56	COPTIS TRIFOLIA	TRIFOLIATE GOLDTHREAD
COCA	57	CORNUS CANADENSIS	BUNCHBERRY DOGWOOD
DODEC	58	DODECATHEON SPP.	SHOOTING STAR
EP	59	EPILOBIUM	FIREWEED
EQUIS	65	EQUISETUM SPP.	HORSETAIL
FACR	61	FAURIA CRISTA-GALLI	DEER CABBAGE
GA	62	GALIUM _____	BEDSTRAW
GEDO	63	GENTIANA DOUGLASIANA	SWAMP GENTIAN
GEPL	64	GENTIANA PLATYPETALA	BLUE GENTIAN
GECA4	66	GEUM CALTHIFOLIUM	CALTHA-LEAF AVENS
HELA	67	HERACLEUM LANATUM	COW PARSNIP
HIMO	68	HIPPURIS MONTANA	MOUNTAIN MARESTAIL
LI	69	LISTERA _____	TWAYBLADE
LYAM	71	LYSICHITUM AMERICANUM	YELLOW SKUNK CABBAGE
MADI2	72	MAIANTHEMUM DIALATATUM	DEERBERRY
MOUN	73	MONESES UNIFLORA	SINGLE DELIGHT
OS	74	OSMORHIZA _____	SWEET CICELY

ABBREVIATION	CODE	GENUS AND SPECIES	COMMON NAME
PAFI	76	PARNASSIA FIMBRIATA	GRASS OF PARNASSUS
PIVU	77	PINGUICULA VULGARIS	COMMON BUTTERWORT
PRAL	78	PRENANTHES ALATA	RATTLESNAKE ROOT
PTAQ	79	PTERIDIUM AQUILINUM	WESTERN BRACKEN FERN
PYAS	81	PYROLA ASARIFOLICE _	WINTERGREEN
RA	82	RANUNCULUS _____	BUTTERCUP
RUPE	83	RUBUS PEDATUS	FIVE-LEAF BRAMBLE
SA	84	SANGUISORBA _____	BURNET
SA	85	SAXIFRAGA _____	SAXIFRAGE
STAM	86	STREPTOPUS AMPLEXIFOLIUS	CLASPING TWISTED-STALK
STRO	87	STREPTOPUS ROSEUS	ROSY TWISTED-STALK
TITR	88	TIARELLA TRIFOLIATA	TRIFOLIATE FOAMFLOWER
VASI	89	VALERIANA SITCHENSIS	SITKA VALERIAN
VEVI	90	VERATRUM VIRIDE	FALSE HELLEBORE
VIGL	91	VIOLA GLABELLA	STREAM VIOLET
VILA	92	VIOLA LANGSDORFFII	ALASKA VIOLET
		ESTUARINE	
E1	11		SPARSELY VEGETATED MUDFLAT
E2	12		ESTUARINE SEDGE MARSHLAND
E3	13		MIXED FORB GRASSLAND
		ALPINE	
A1	21		ALPINE MEADOW
		MUSKEG	
M1	15		SEDGE AND SPHAGNUM
M2	30		MYRICA GALE
M3	31		SCOURING RUSH
		OTHER	
	70		BARE ROCK
	75		BARE ALLUVIUM
	80		CLEARCUT

LAND USE DATABASE
ASA / ARA BY "A" CHANNEL TYPE



LAND USE DATABASE
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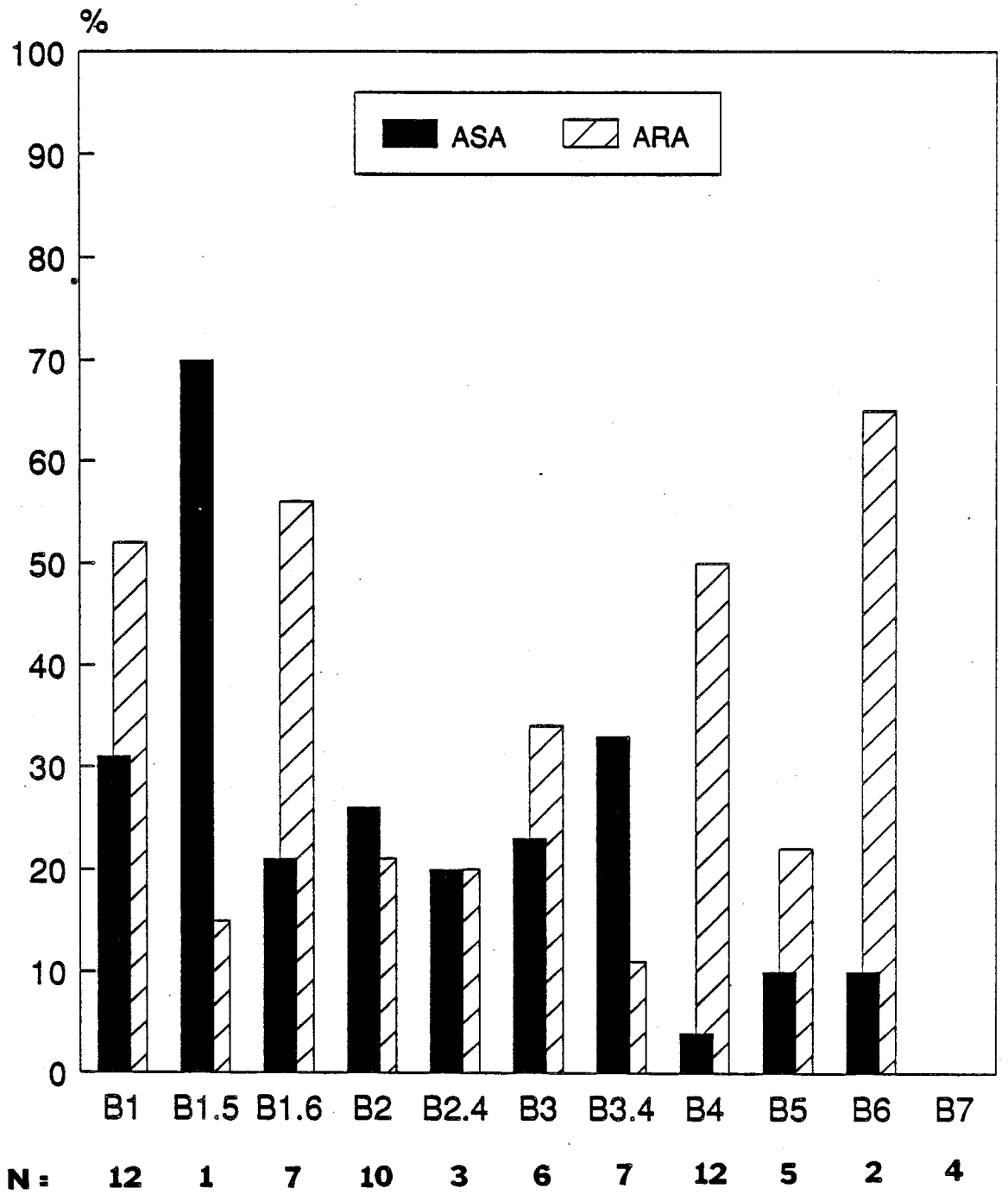

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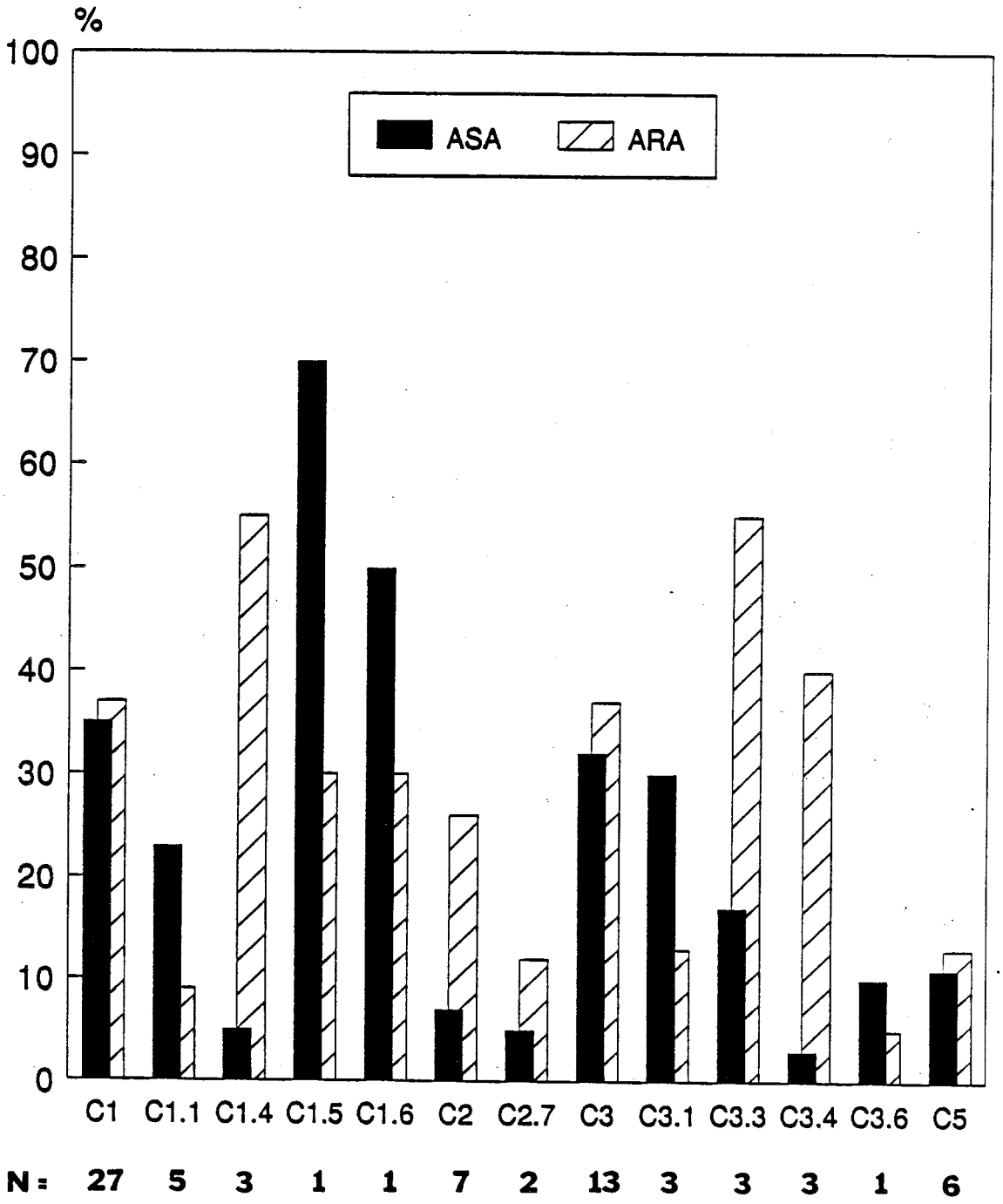

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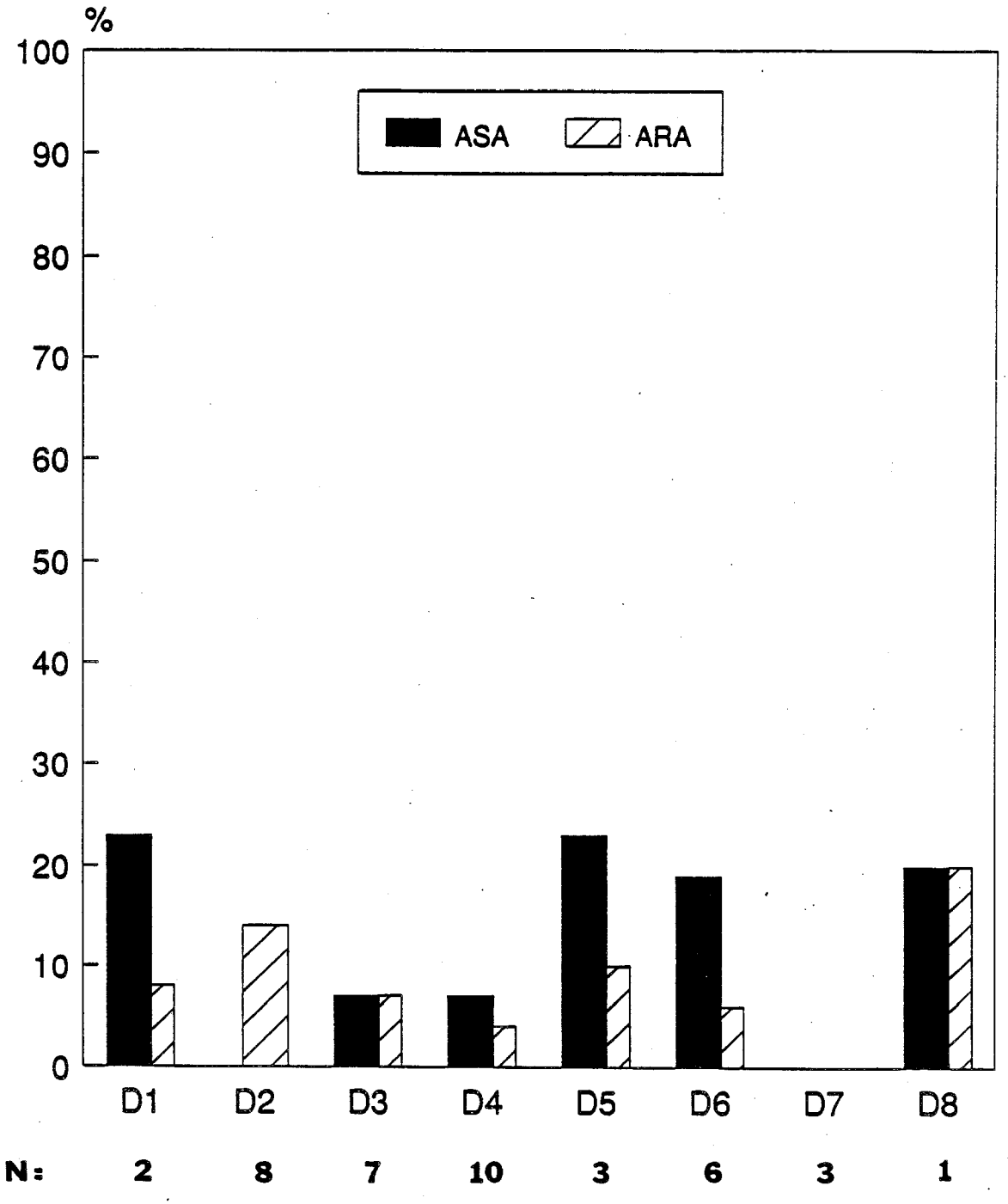
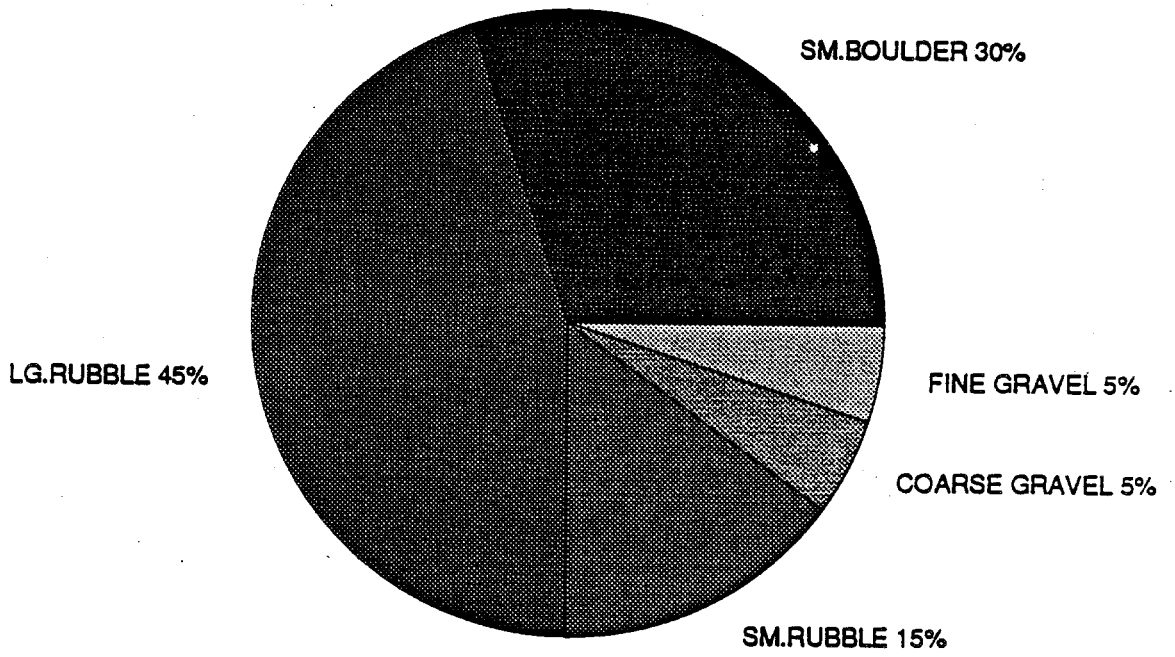
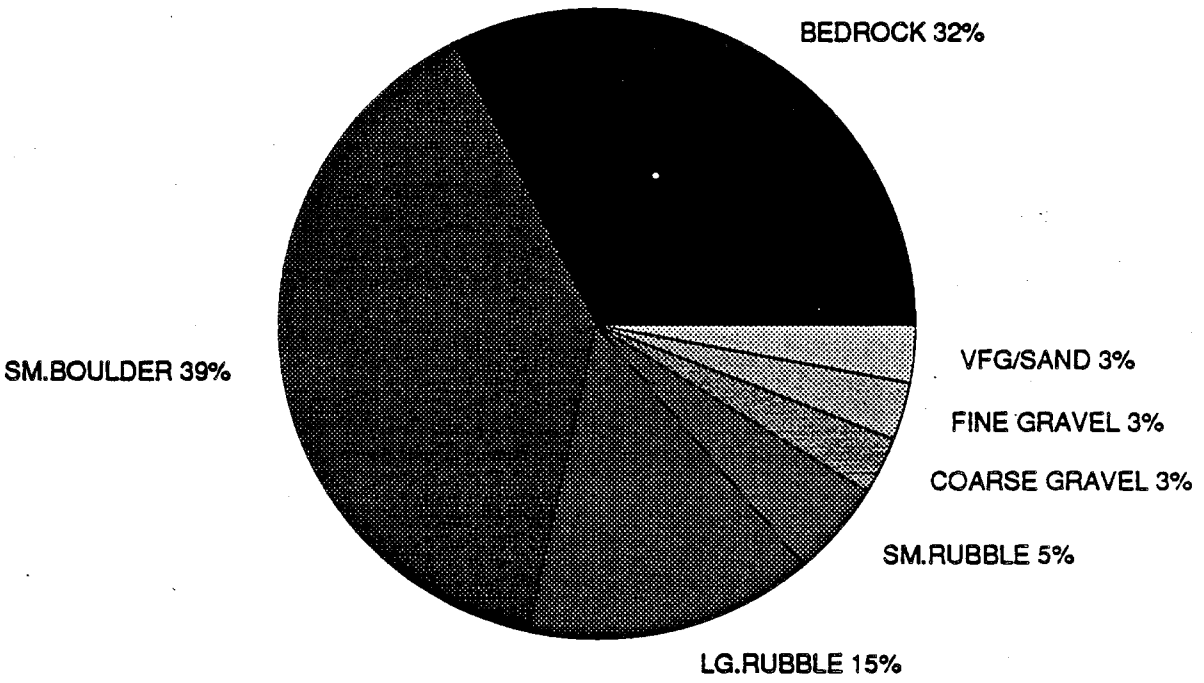


LAND USE DATABASE
SUBSTRATE COMPOSITION OF A1 CHANNELS



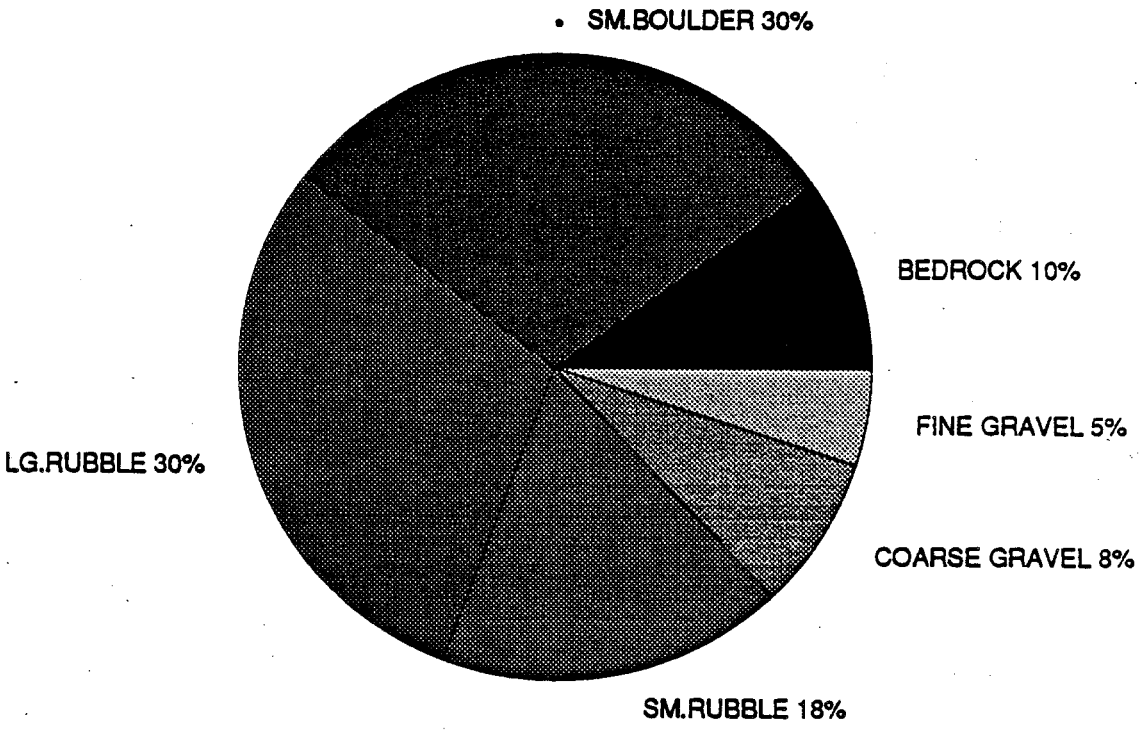
NUMBER OF SAMPLES = 1

LAND USE DATABASE
SUBSTRATE COMPOSITION OF A2 CHANNELS



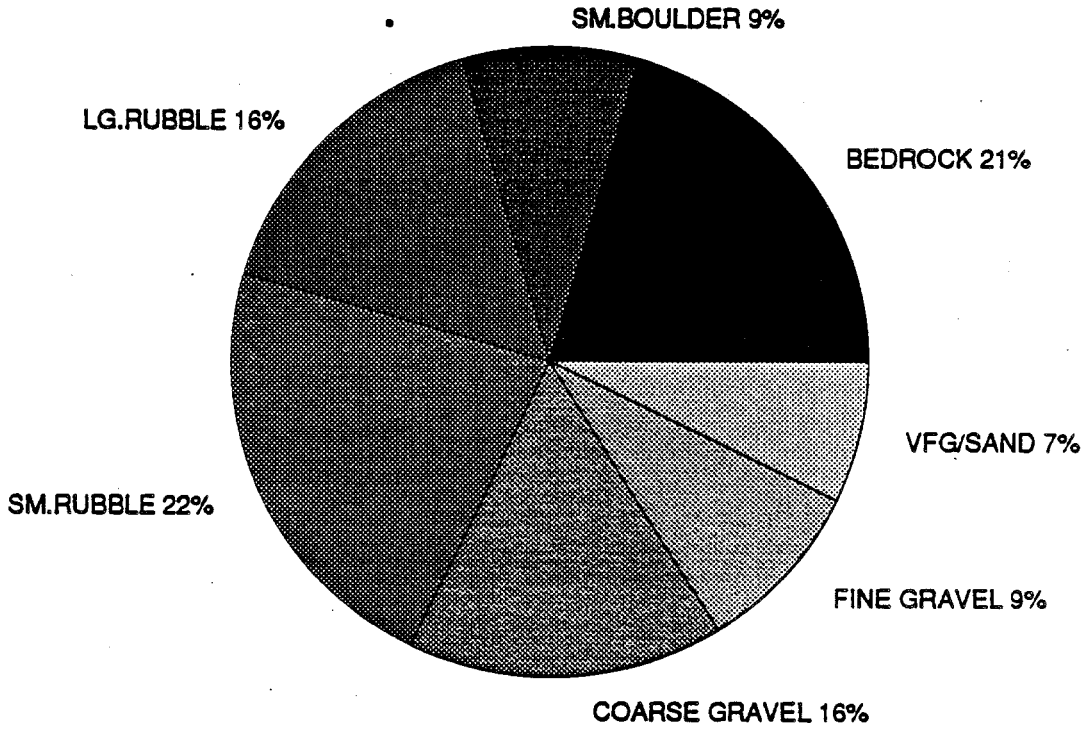
NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF A3 CHANNELS



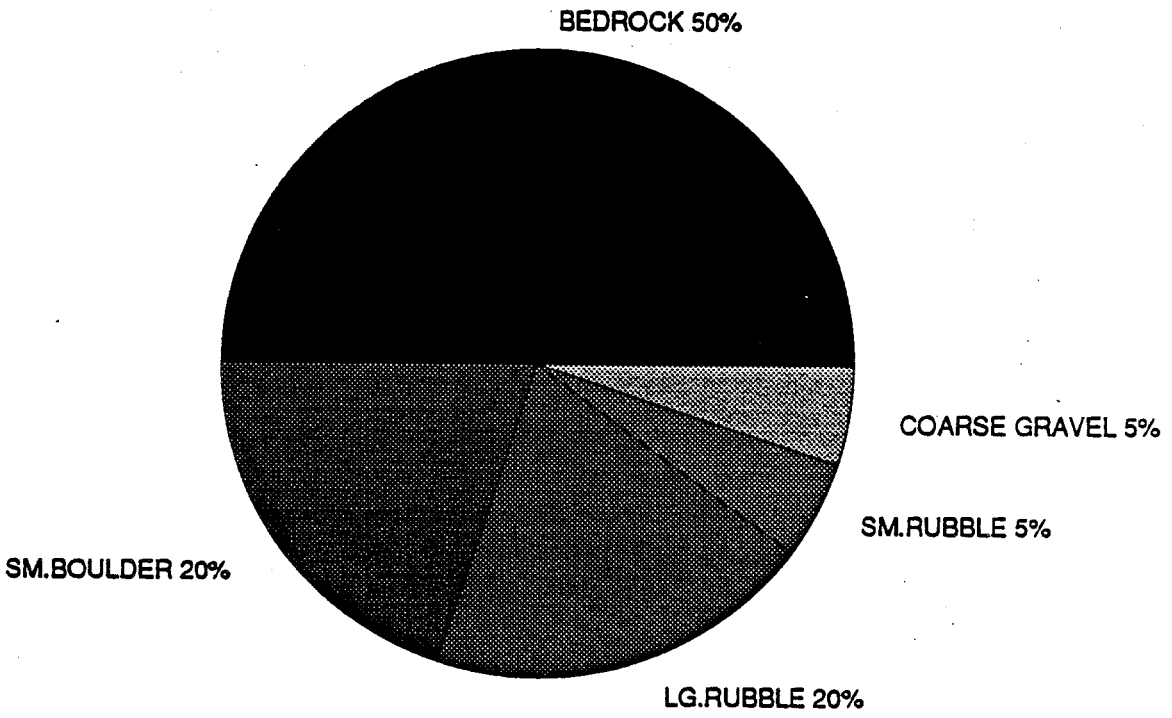
NUMBER OF SAMPLES = 2

LAND USE DATABASE
SUBSTRATE COMPOSITION OF A4 CHANNELS



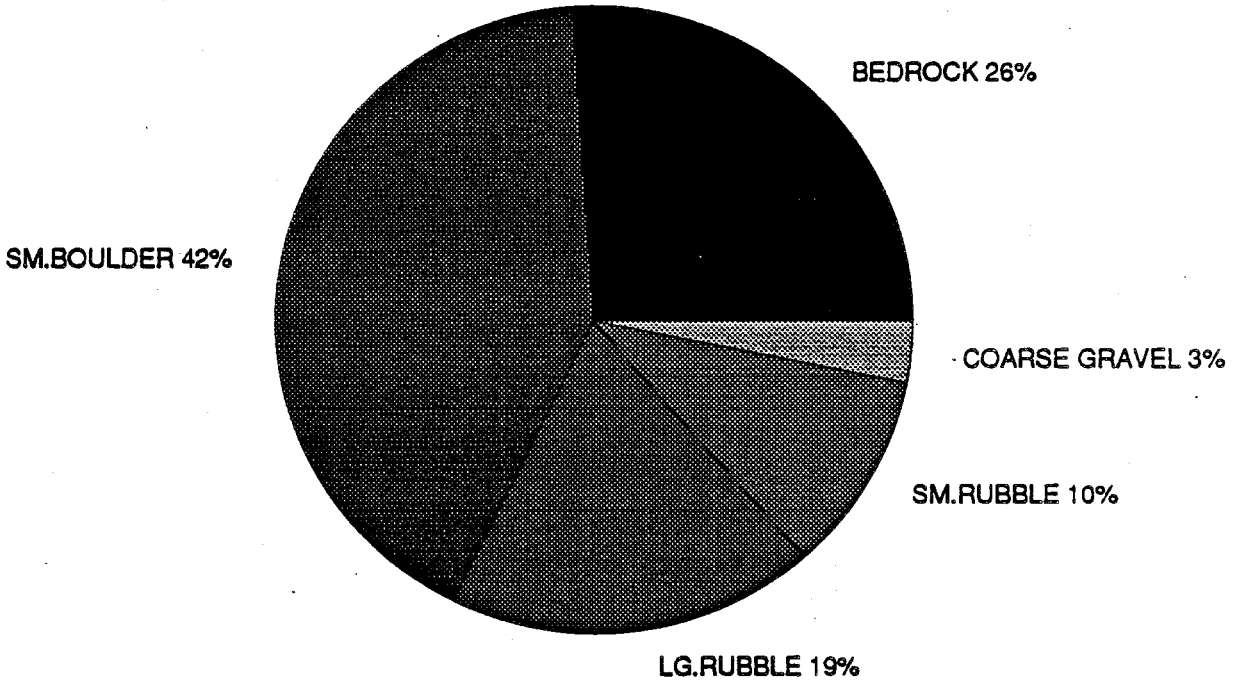
NUMBER OF SAMPLES = 2

LAND USE DATABASE
SUBSTRATE COMPOSITION OF A5 CHANNELS



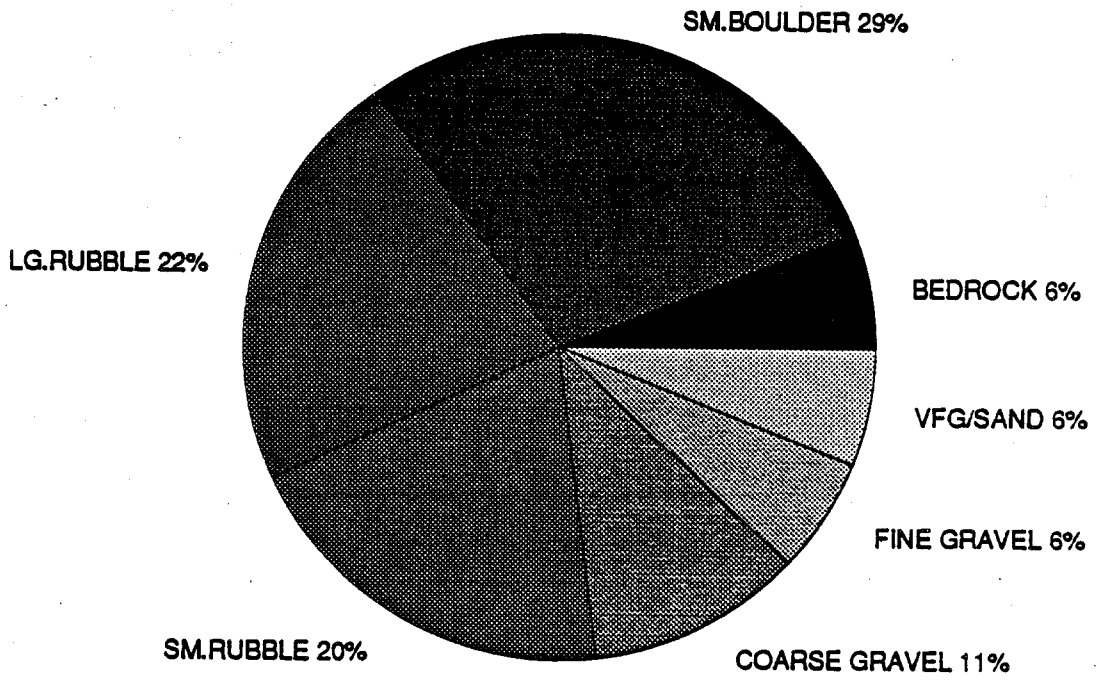
NUMBER OF SAMPLES = 1

LAND USE DATABASE
SUBSTRATE COMPOSITION OF A6 CHANNELS



NUMBER OF SAMPLES = 2

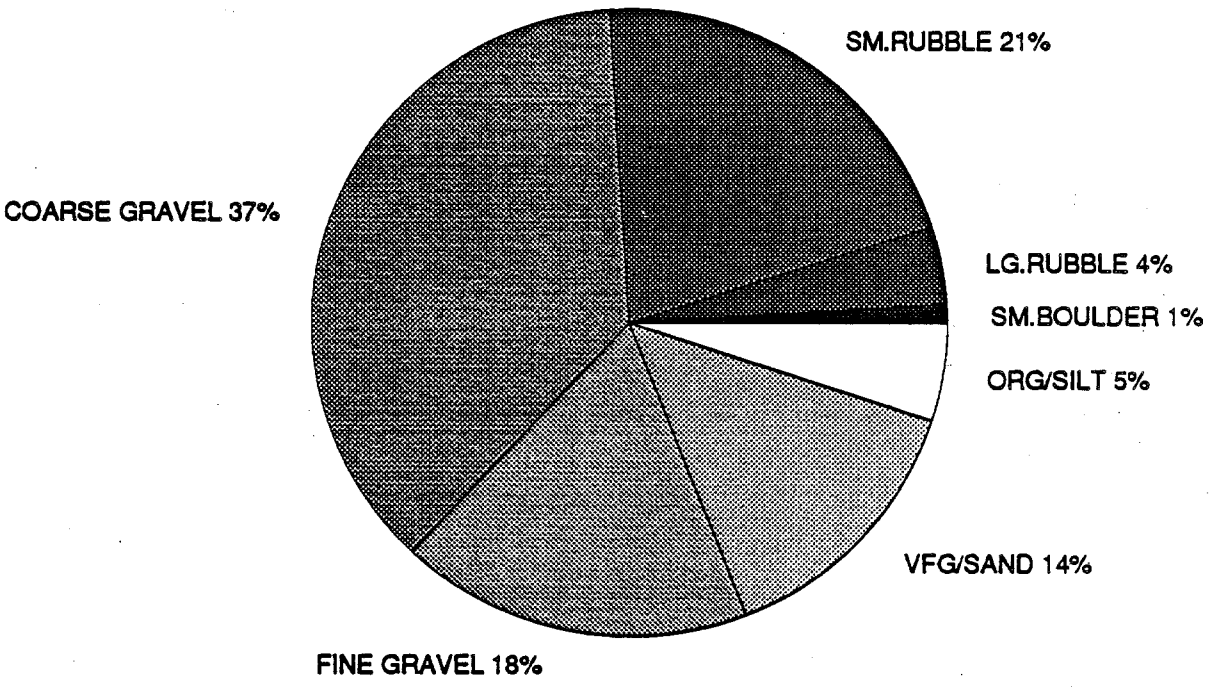
LAND USE DATABASE
SUBSTRATE COMPOSITION OF A7 CHANNELS



NUMBER OF SAMPLES = 5

LAND USE DATABASE

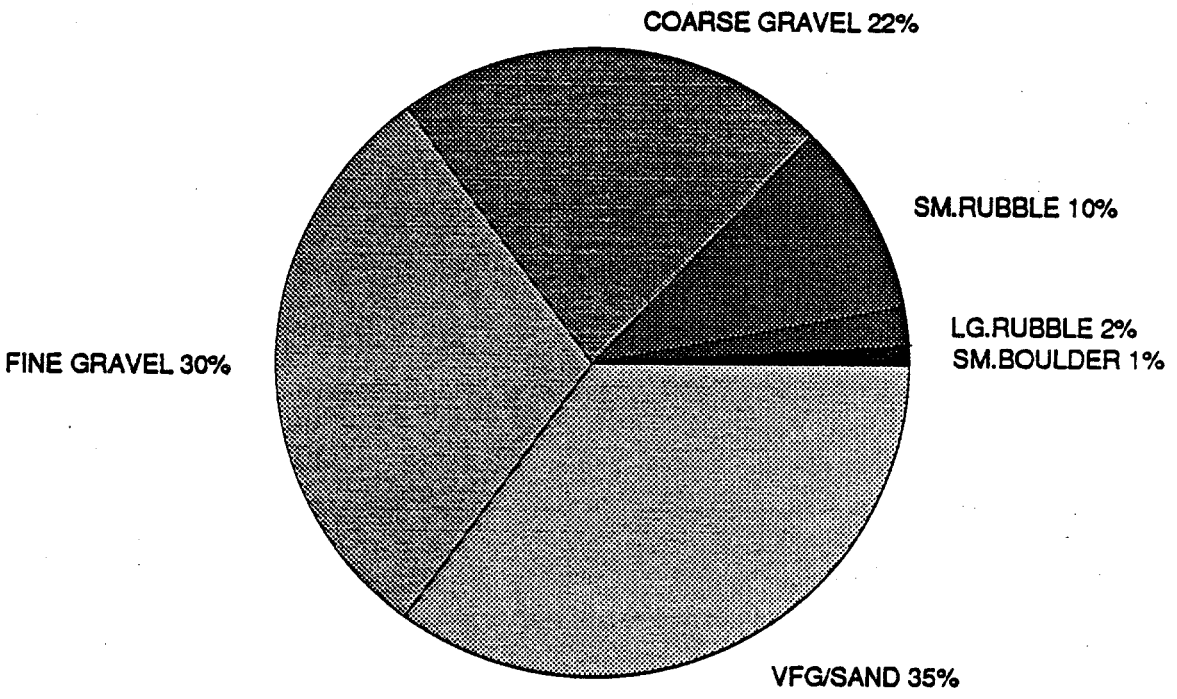
SUBSTRATE COMPOSITION OF B1 CHANNELS



NUMBER OF SAMPLES = 12

LAND USE DATABASE

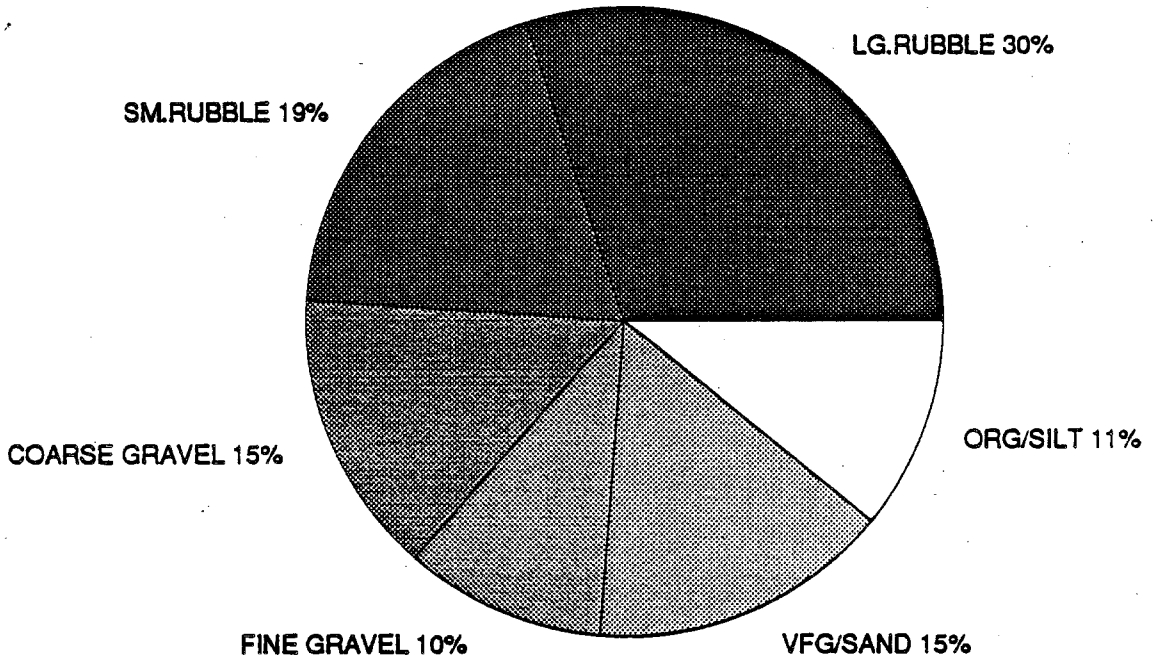
SUBSTRATE COMPOSITION OF B1.5 CHANNELS



NUMBER OF SAMPLES = 1

LAND USE DATABASE

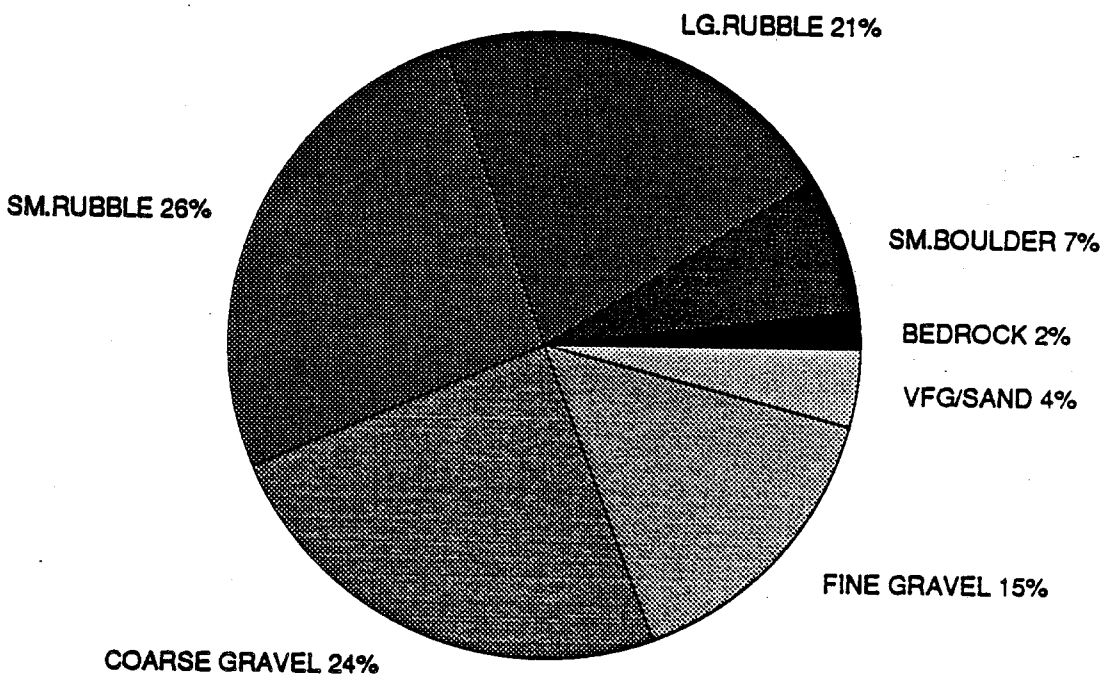
SUBSTRATE COMPOSITION OF B1.6 CHANNELS



NUMBER OF SAMPLES = 7

LAND USE DATABASE

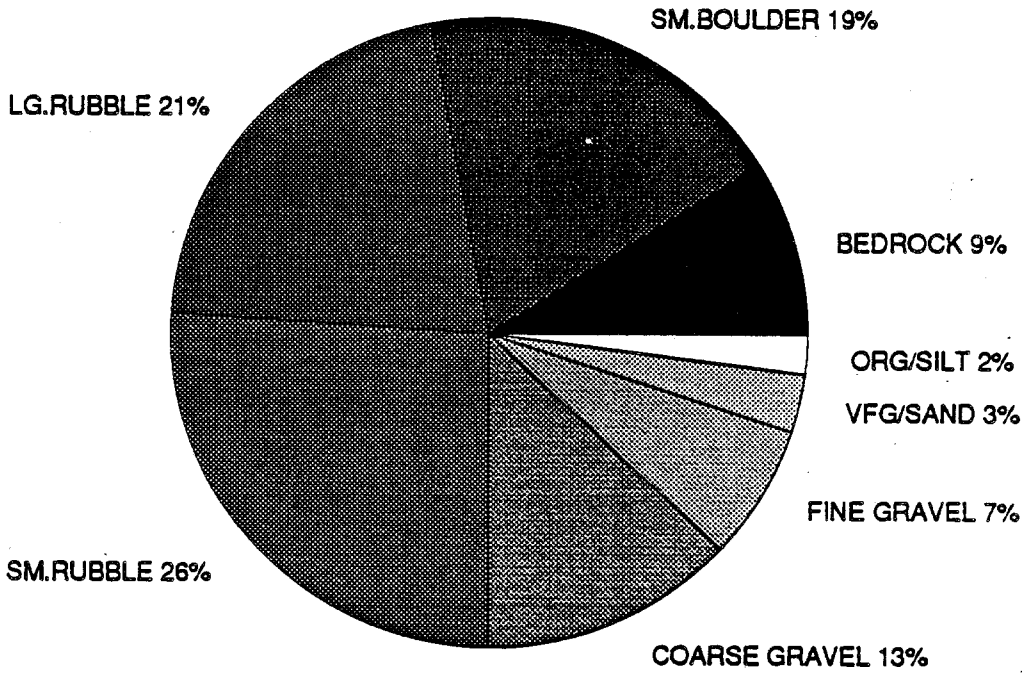
SUBSTRATE COMPOSITION OF B2 CHANNELS



NUMBER OF SAMPLES = 10

LAND USE DATABASE

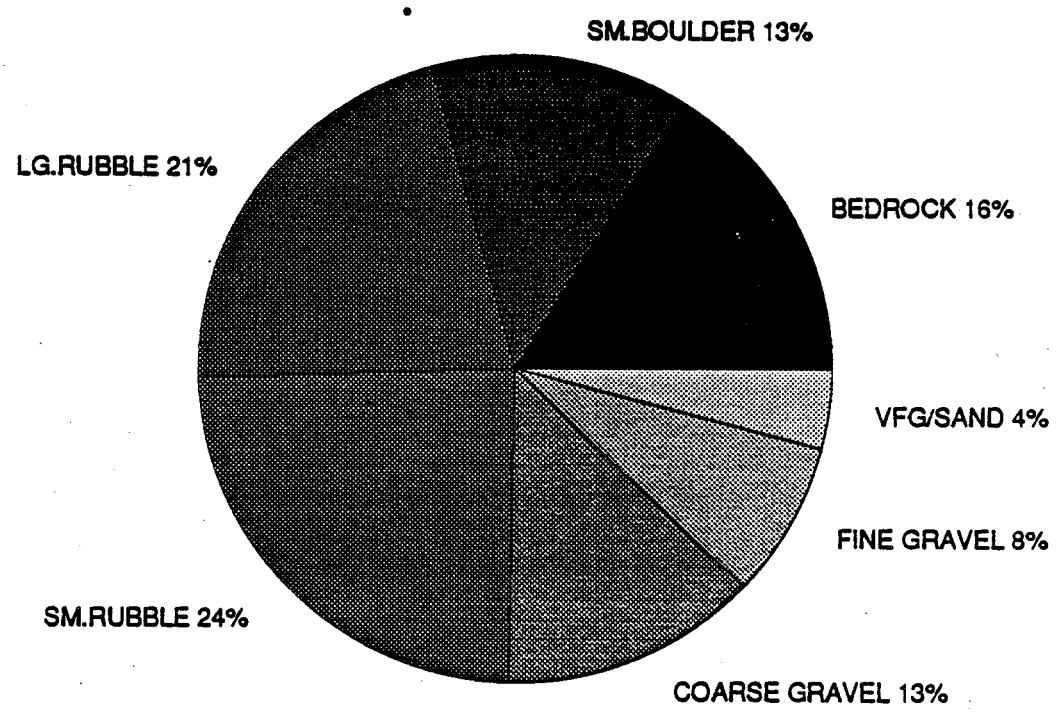
SUBSTRATE COMPOSITION OF B3.4 CHANNELS



NUMBER OF SAMPLES = 7

LAND USE DATABASE

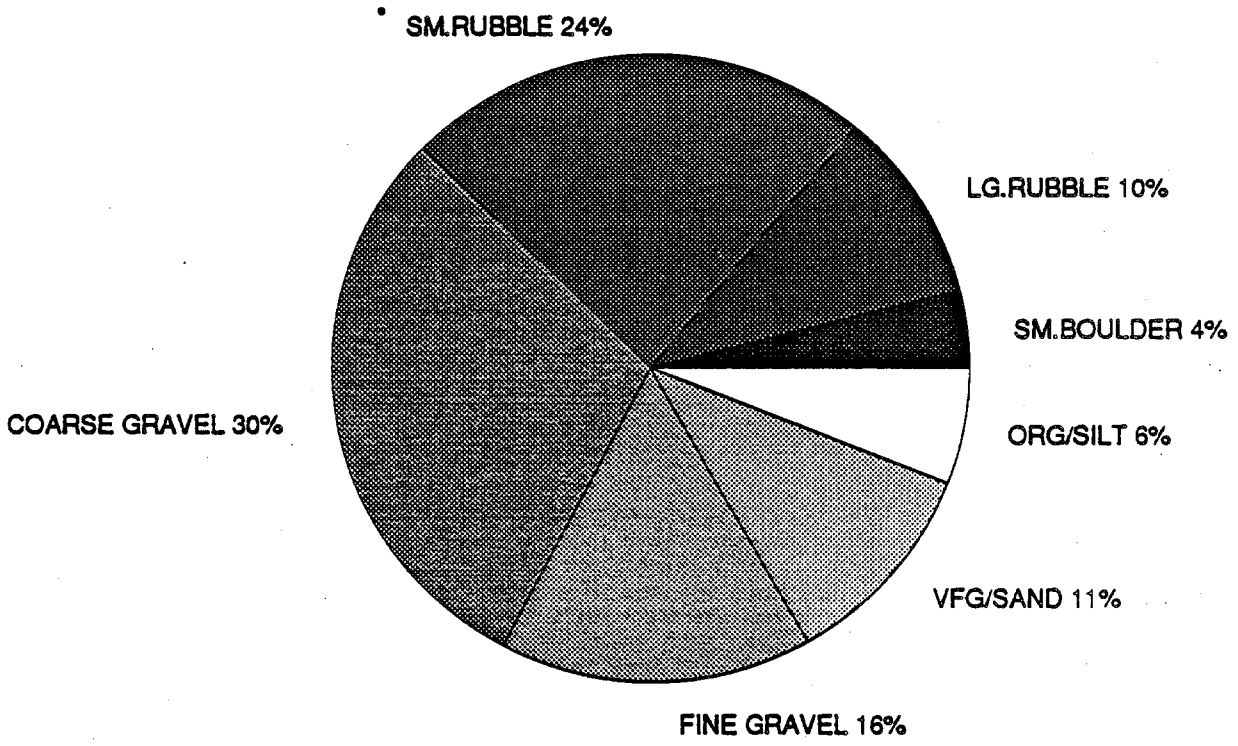
SUBSTRATE COMPOSITION OF B4 CHANNELS



NUMBER OF SAMPLES = 12

LAND USE DATABASE

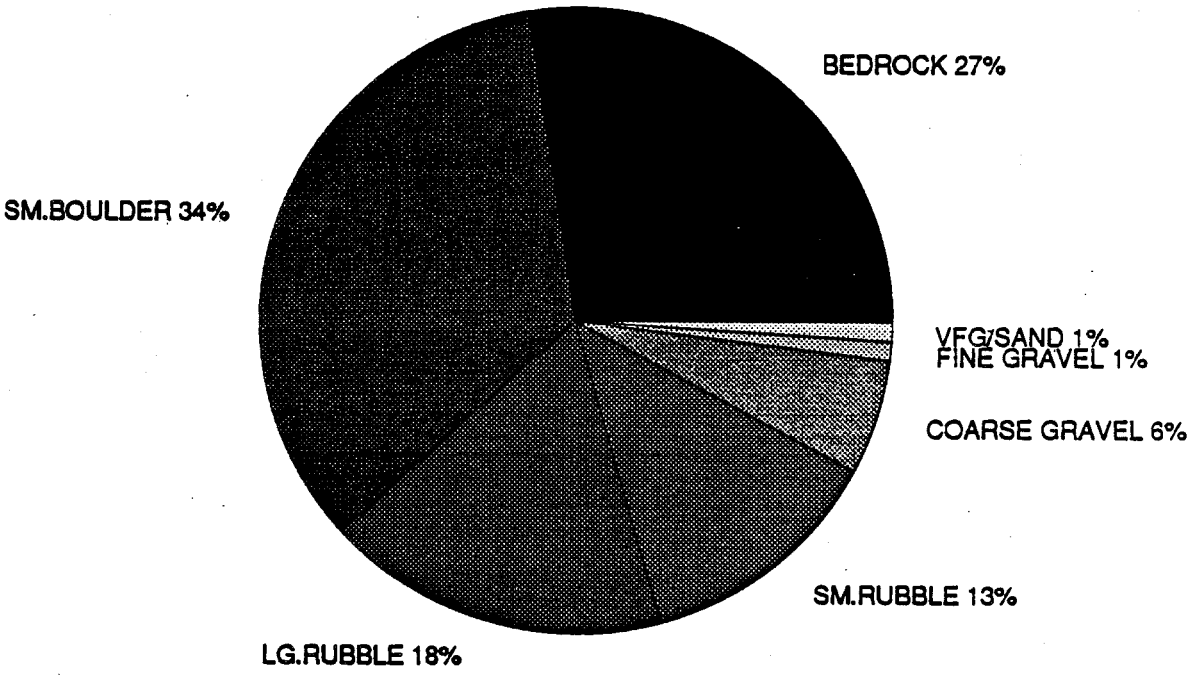
SUBSTRATE COMPOSITION OF B5 CHANNELS



NUMBER OF SAMPLES = 5

LAND USE DATABASE

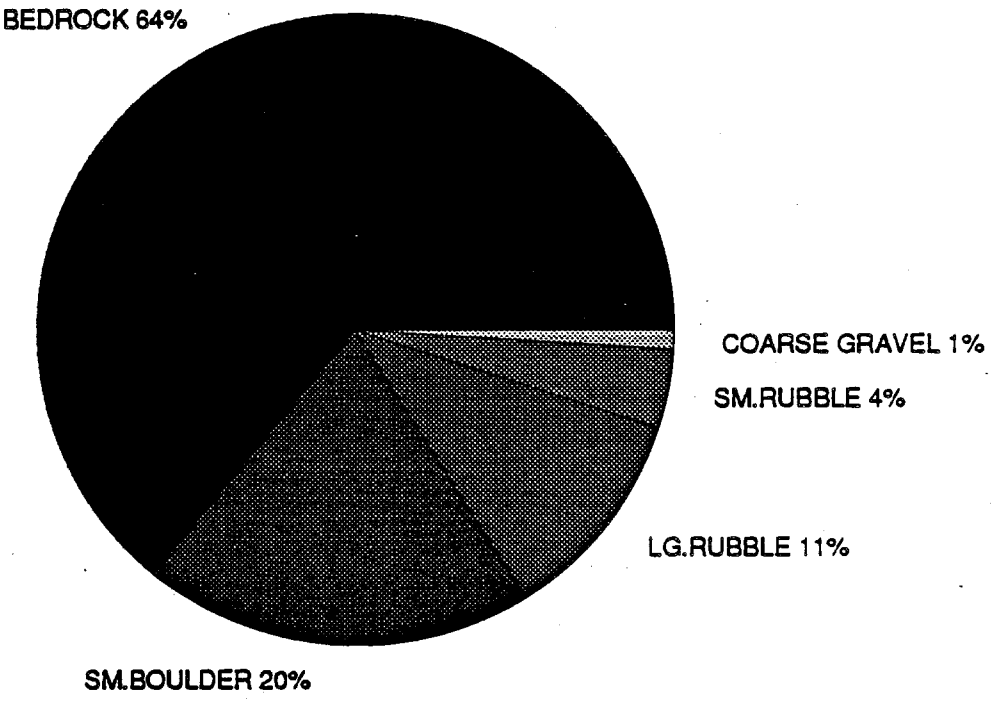
SUBSTRATE COMPOSITION OF B6 CHANNELS



NUMBER OF SAMPLES = 2

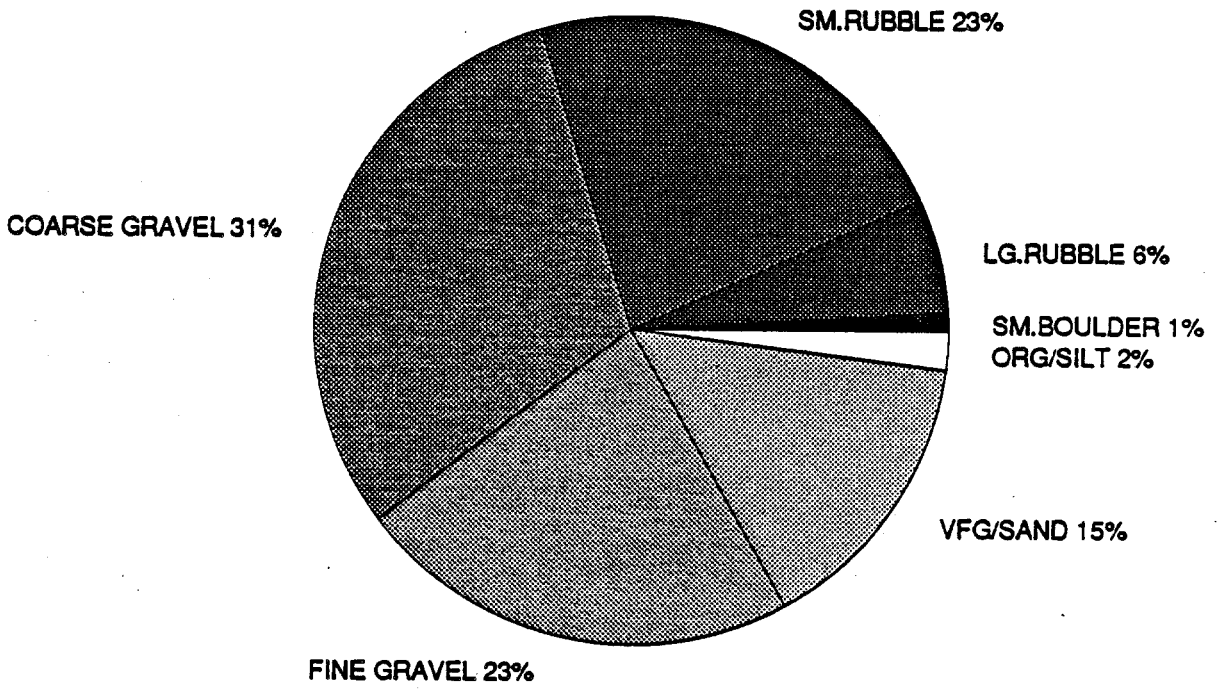
LAND USE DATABASE

SUBSTRATE COMPOSITION OF B7 CHANNELS



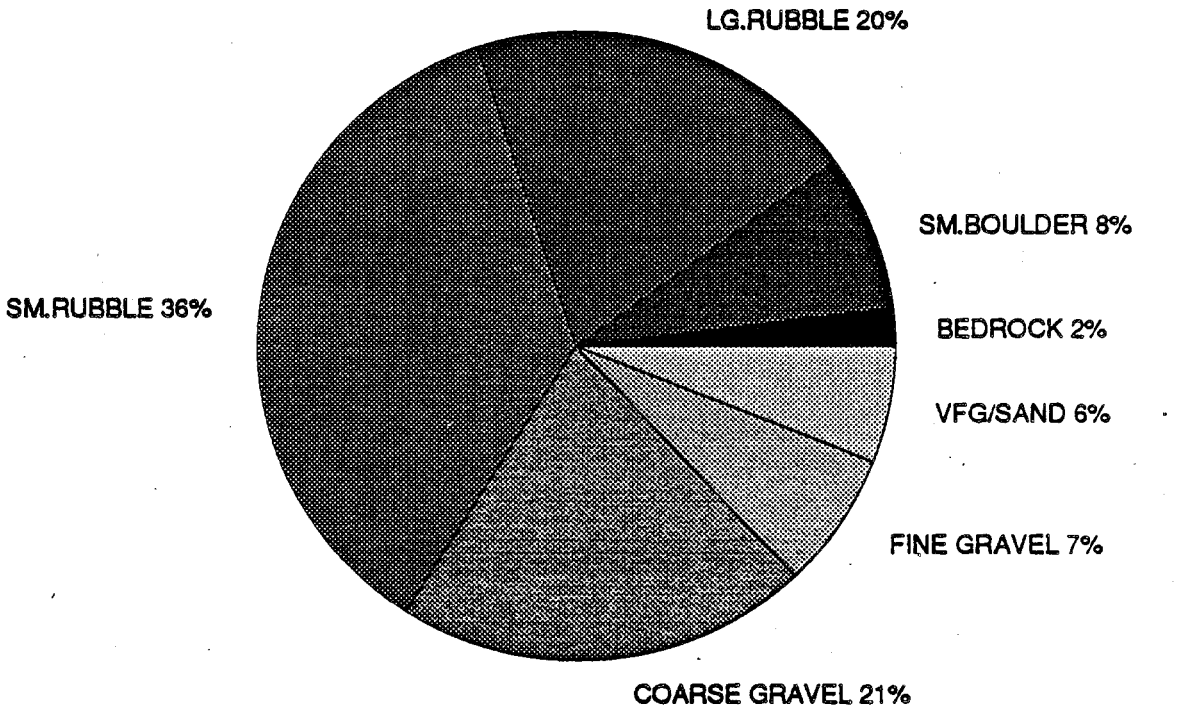
NUMBER OF SAMPLES = 4

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C1 CHANNELS



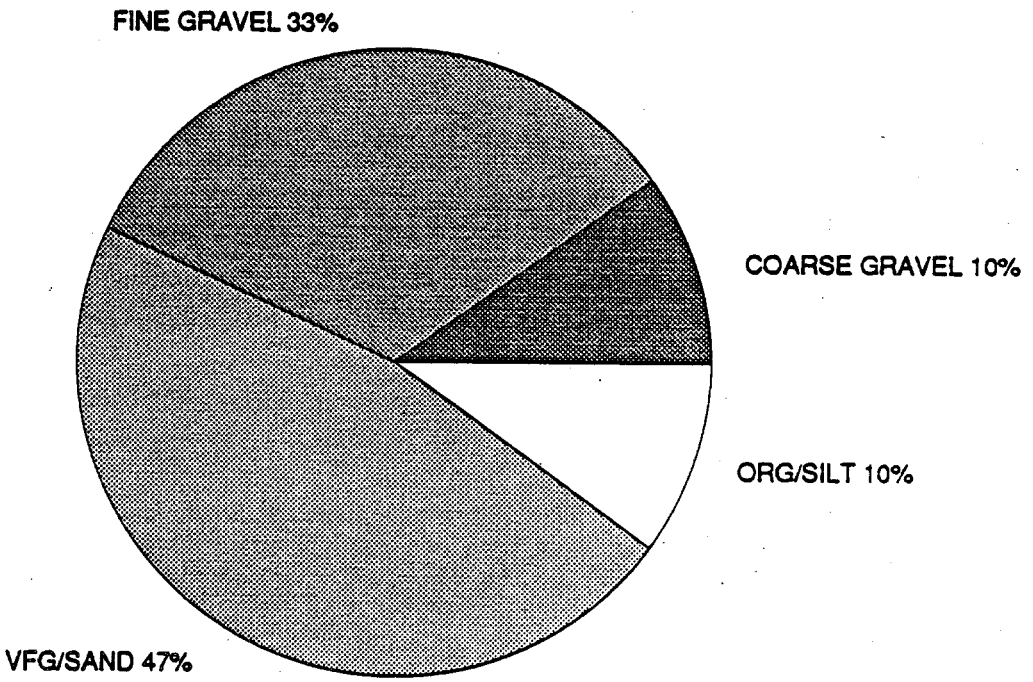
NUMBER OF SAMPLES = 27

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C1.1 CHANNELS



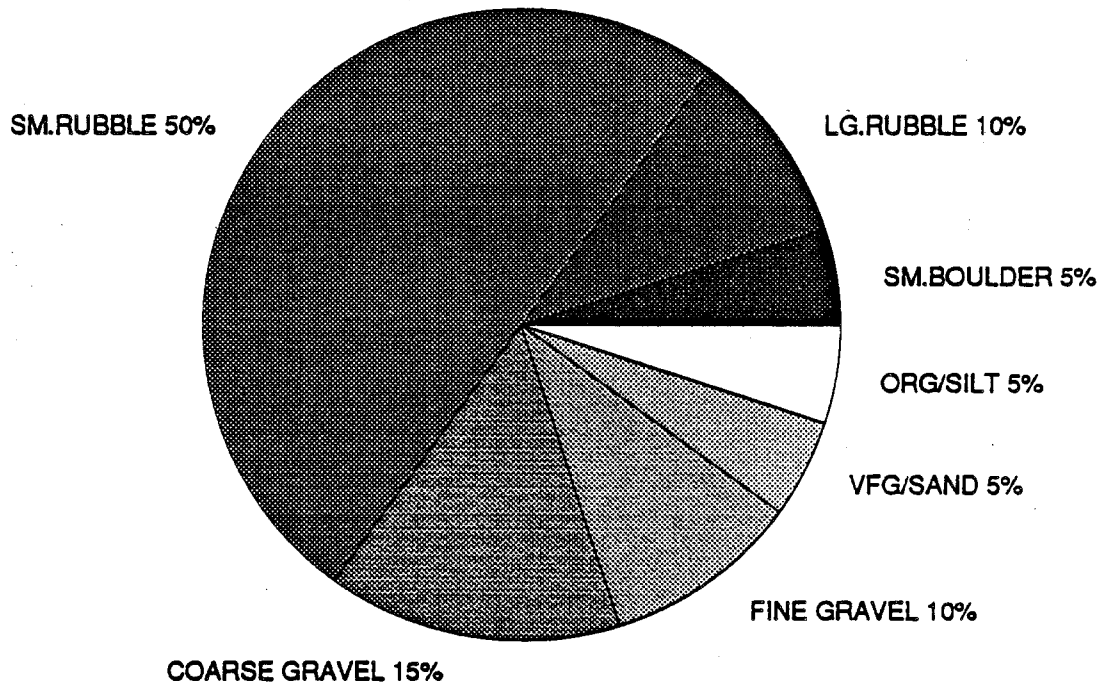
NUMBER OF SAMPLES = 5

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C1.4 CHANNELS



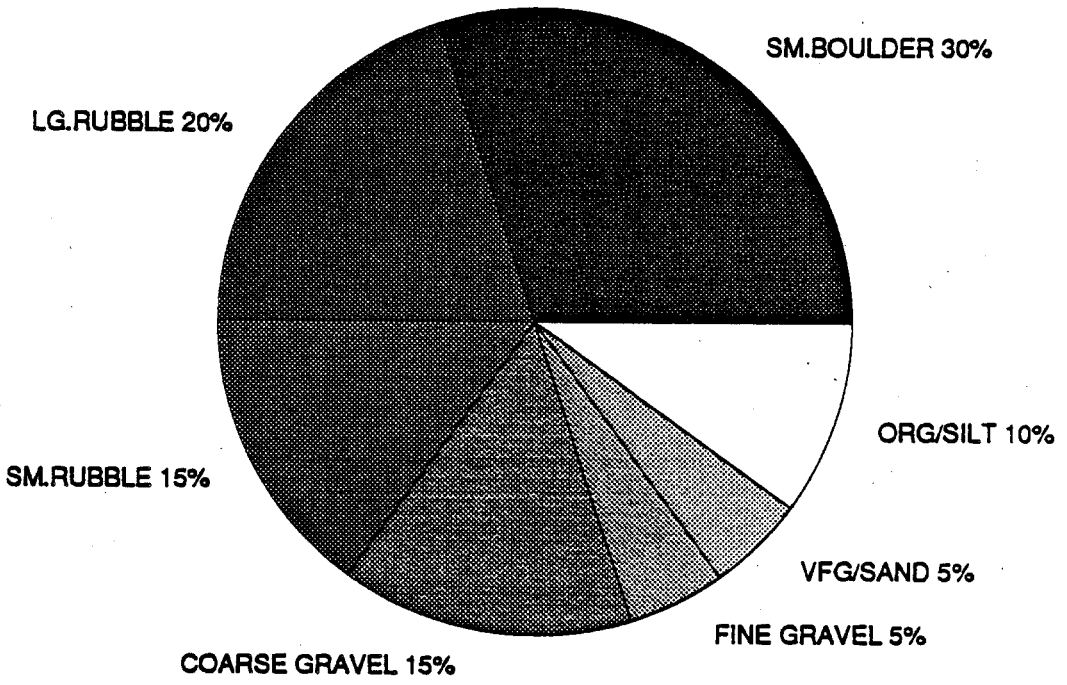
NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C1.5 CHANNELS



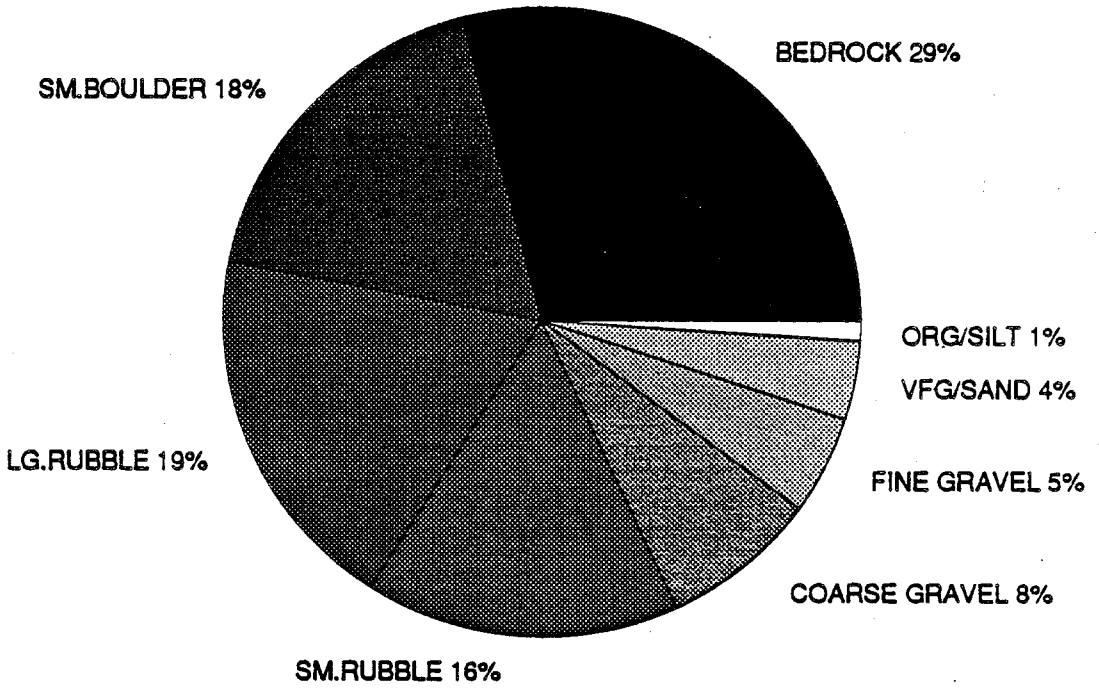
NUMBER OF SAMPLES = 1

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C1.6 CHANNELS



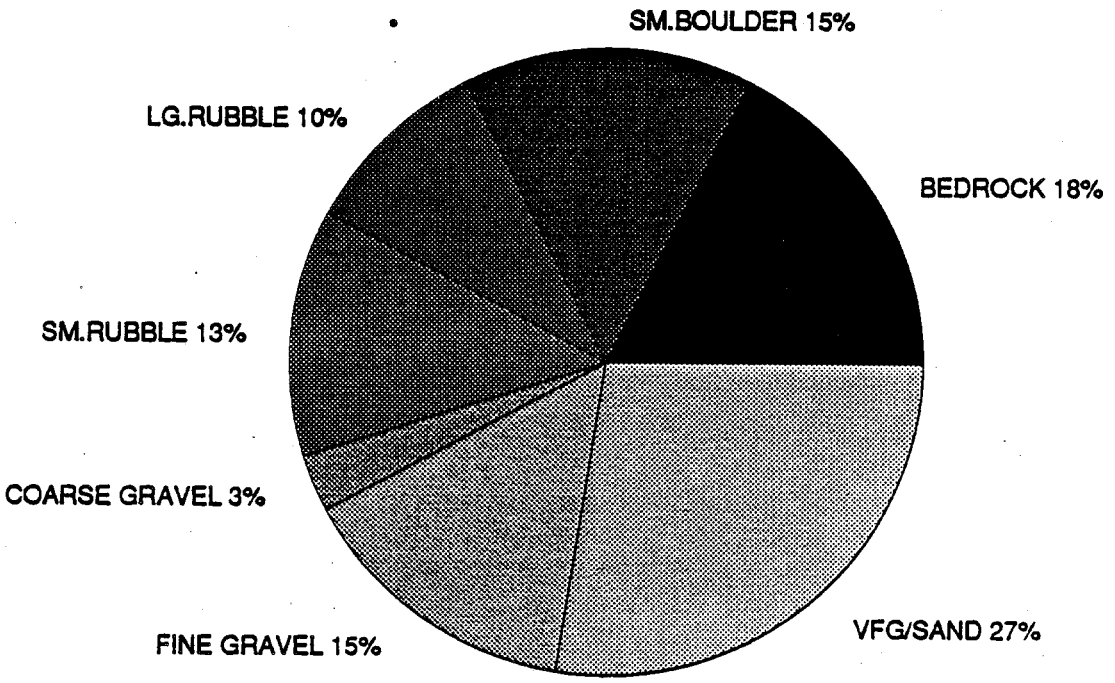
NUMBER OF SAMPLES = 1

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C2 CHANNELS



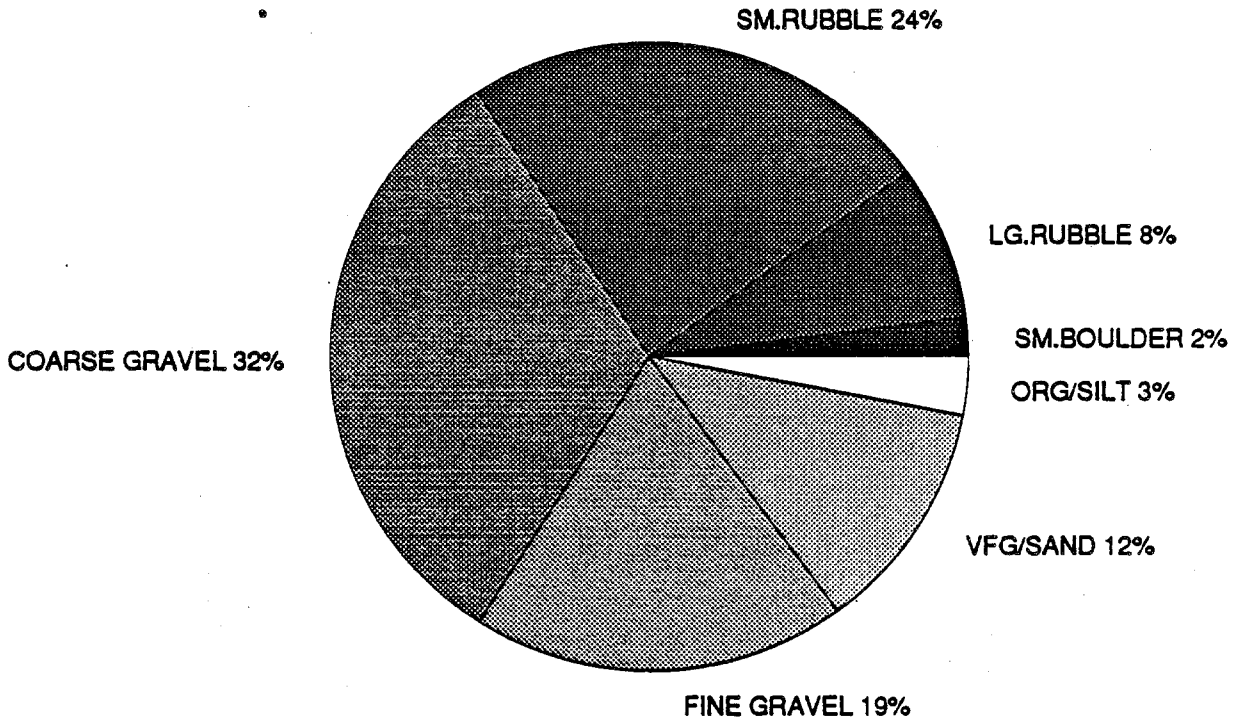
NUMBER OF SAMPLES = 7

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C2.7 CHANNELS



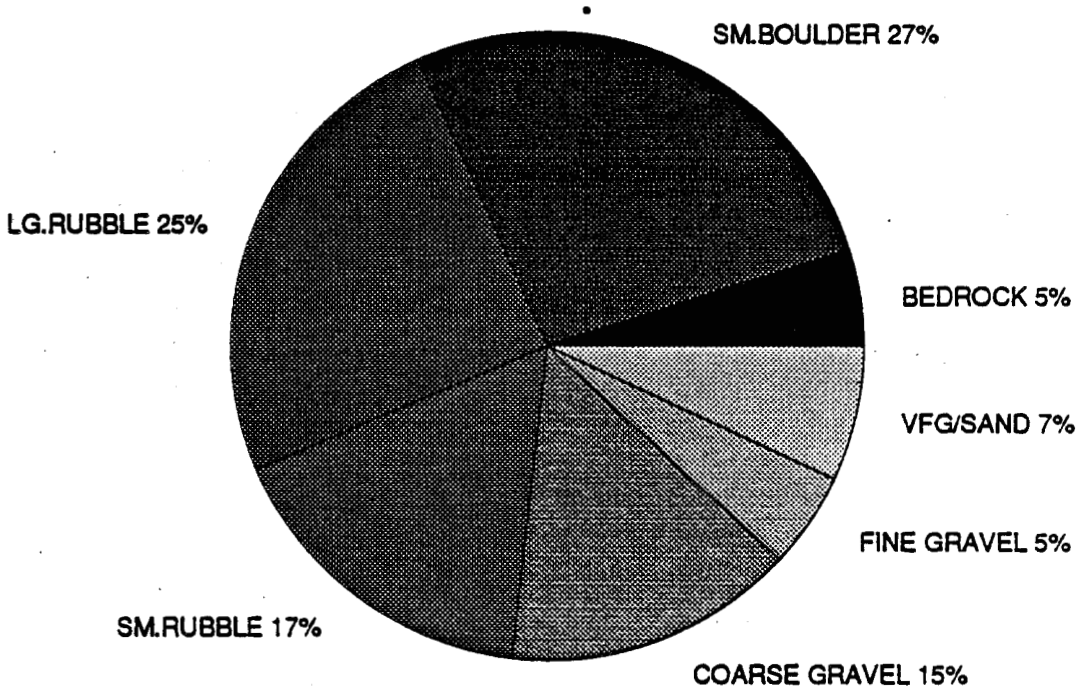
NUMBER OF SAMPLES = 2

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C3 CHANNELS



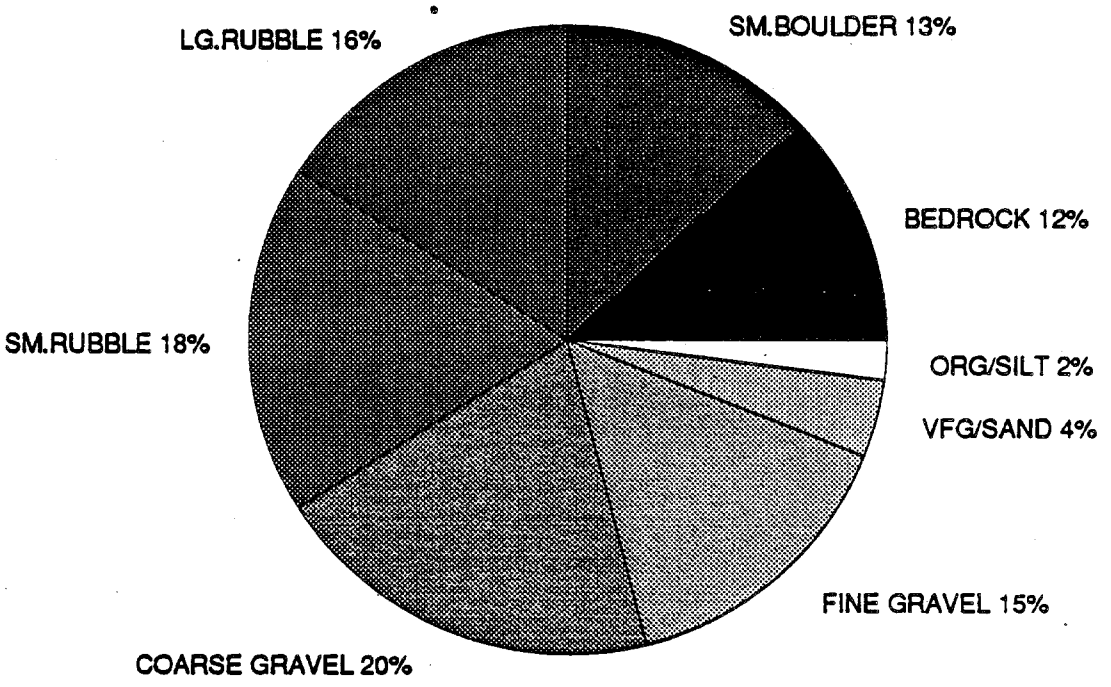
NUMBER OF SAMPLES = 13

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C3.1 CHANNELS



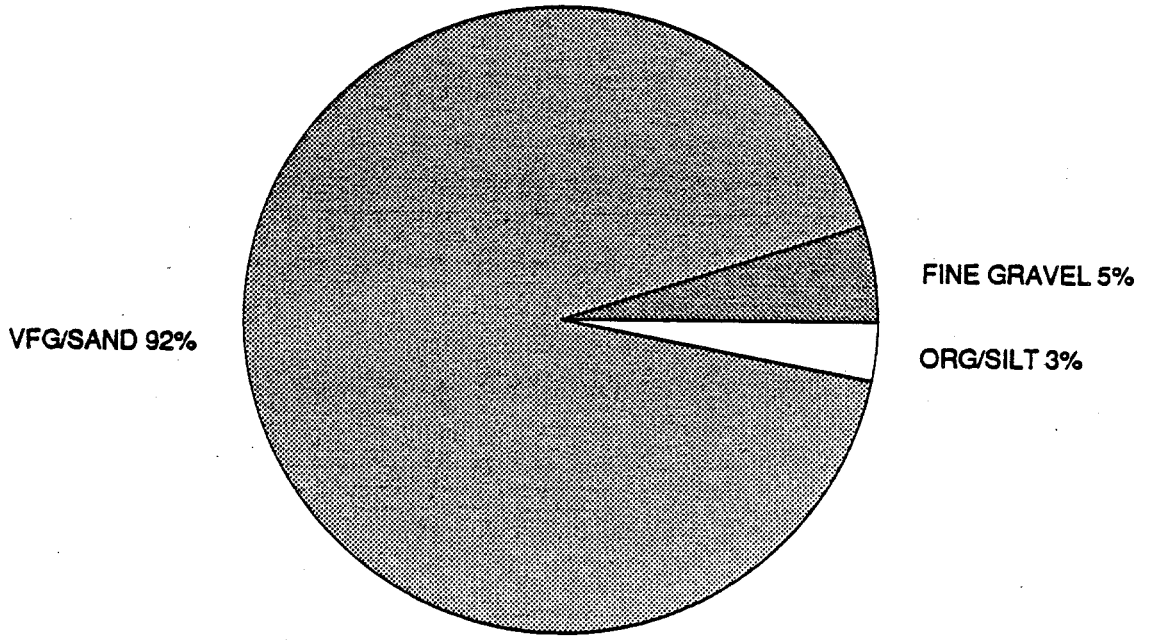
NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C3.3 CHANNELS



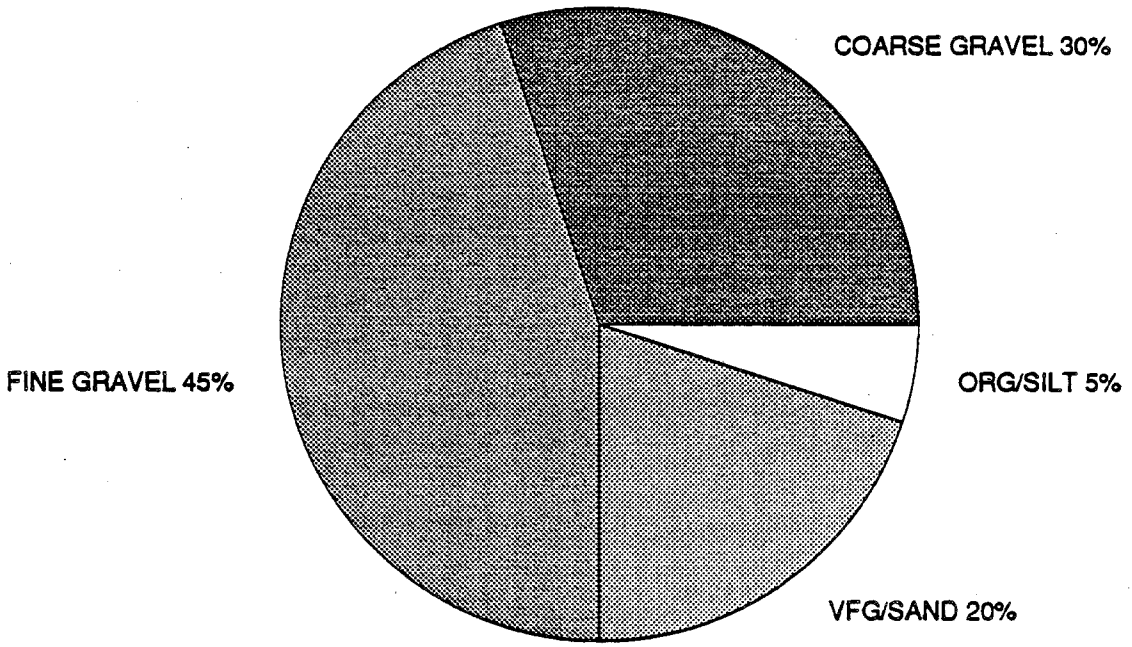
NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C3.4 CHANNELS



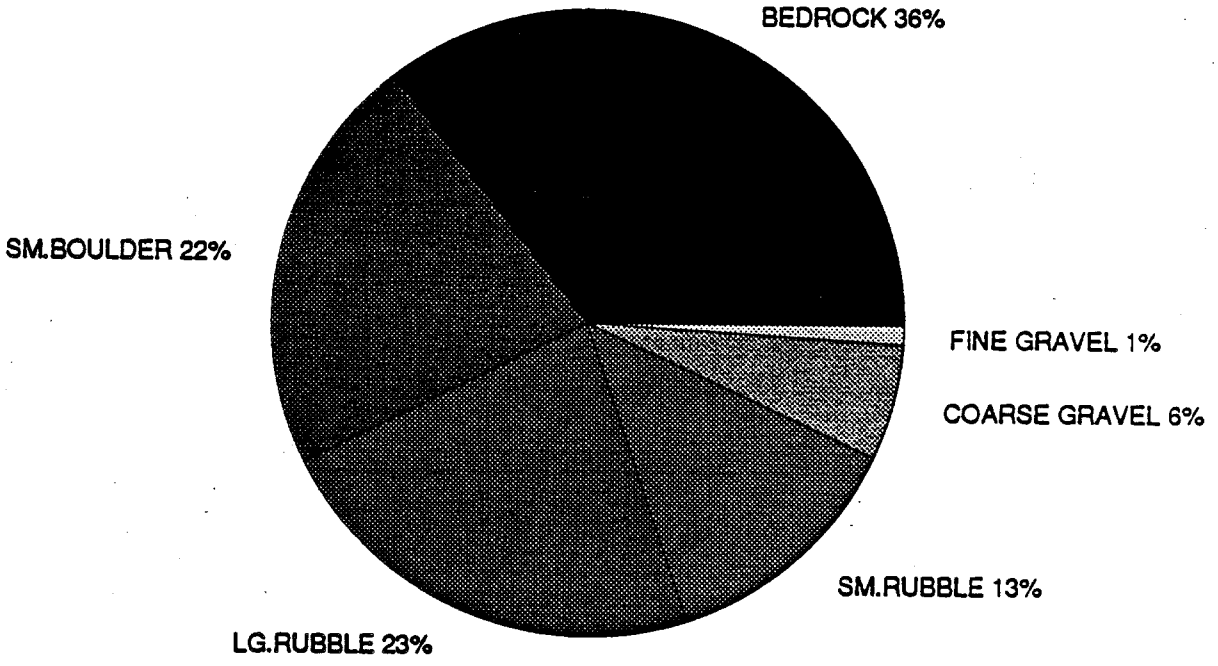
NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C3.6 CHANNELS



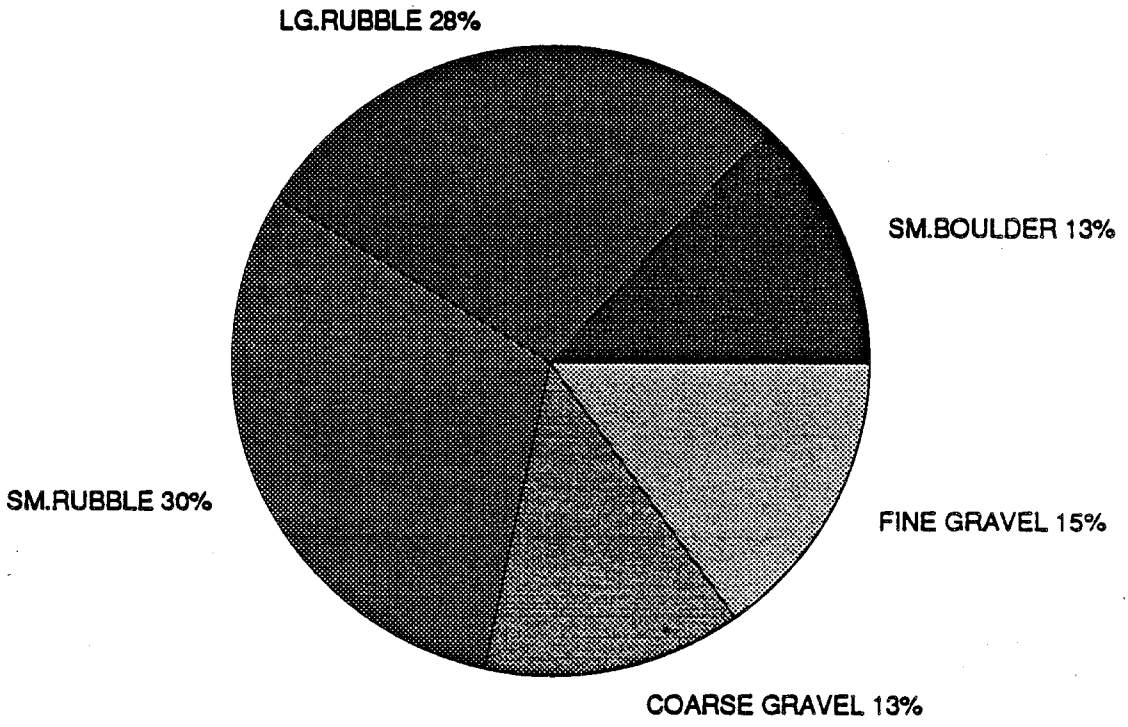
NUMBER OF SAMPLES = 1

LAND USE DATABASE
SUBSTRATE COMPOSITION OF C5 CHANNELS



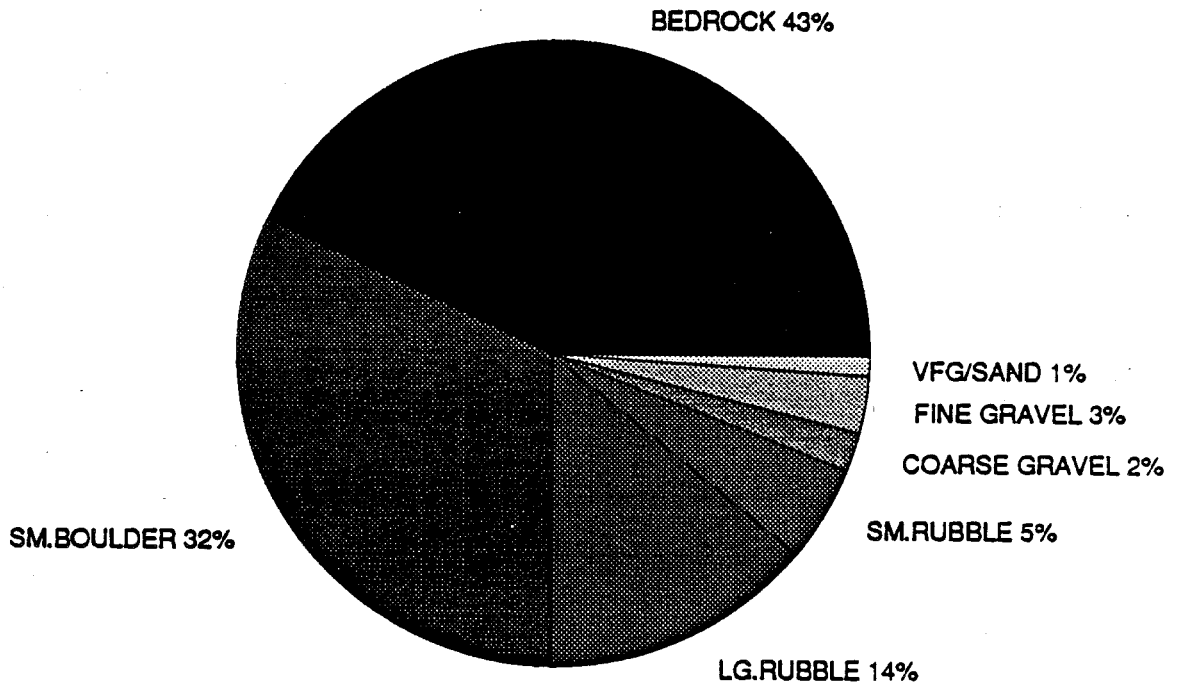
NUMBER OF SAMPLES = 6

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D1 CHANNELS



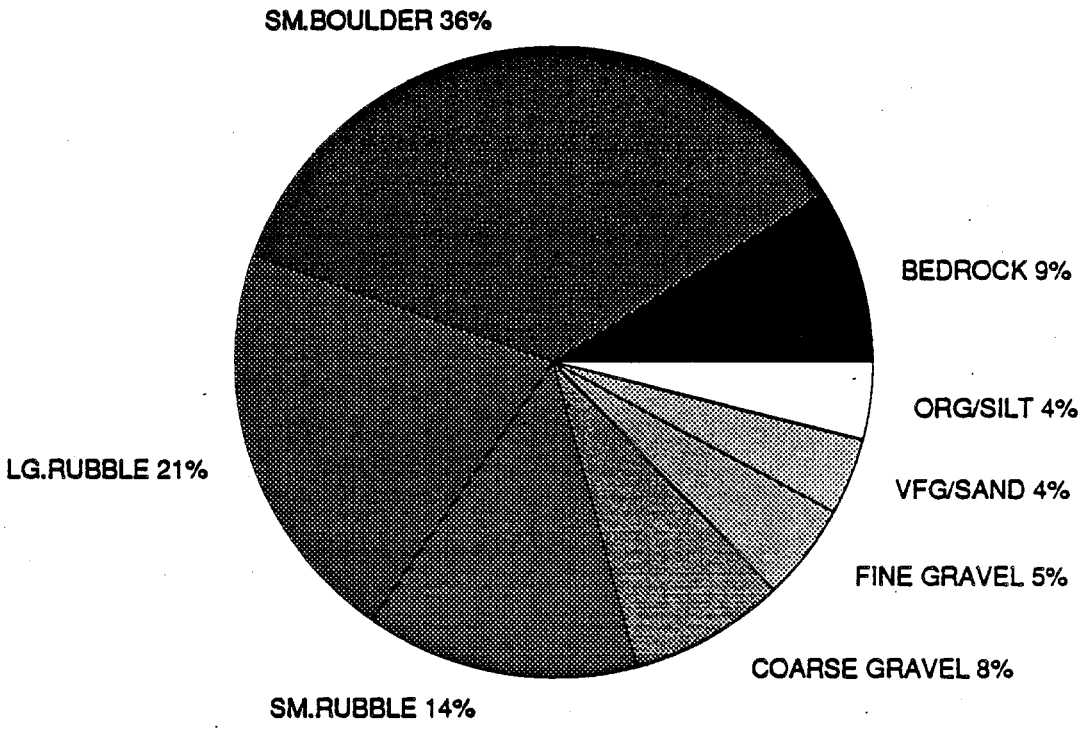
NUMBER OF SAMPLES = 2

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D2 CHANNELS



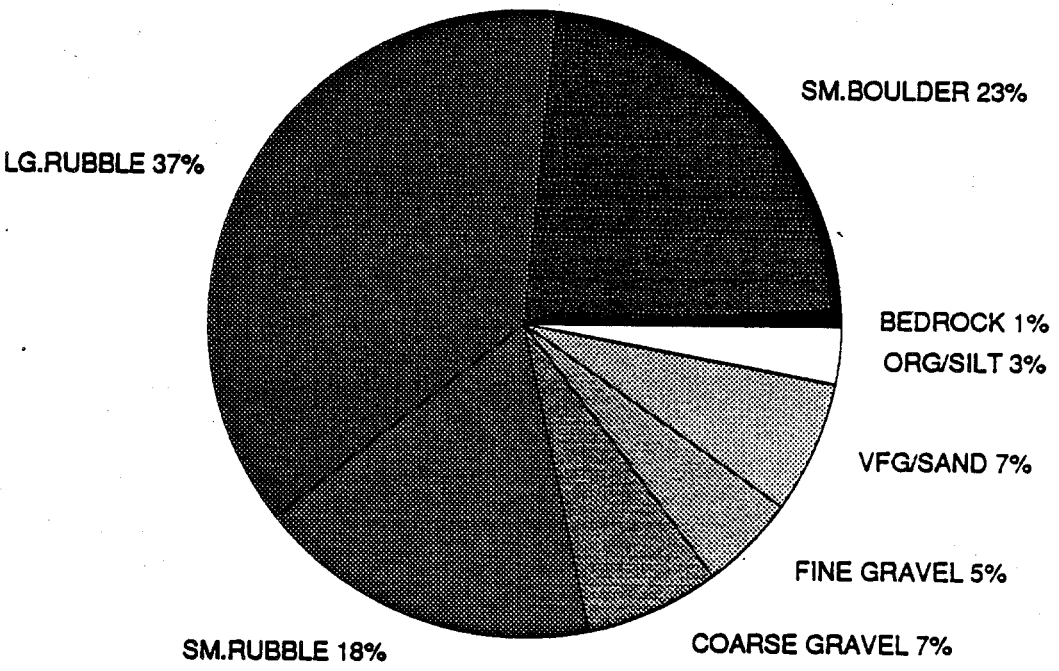
NUMBER OF SAMPLES = 8

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D3 CHANNELS



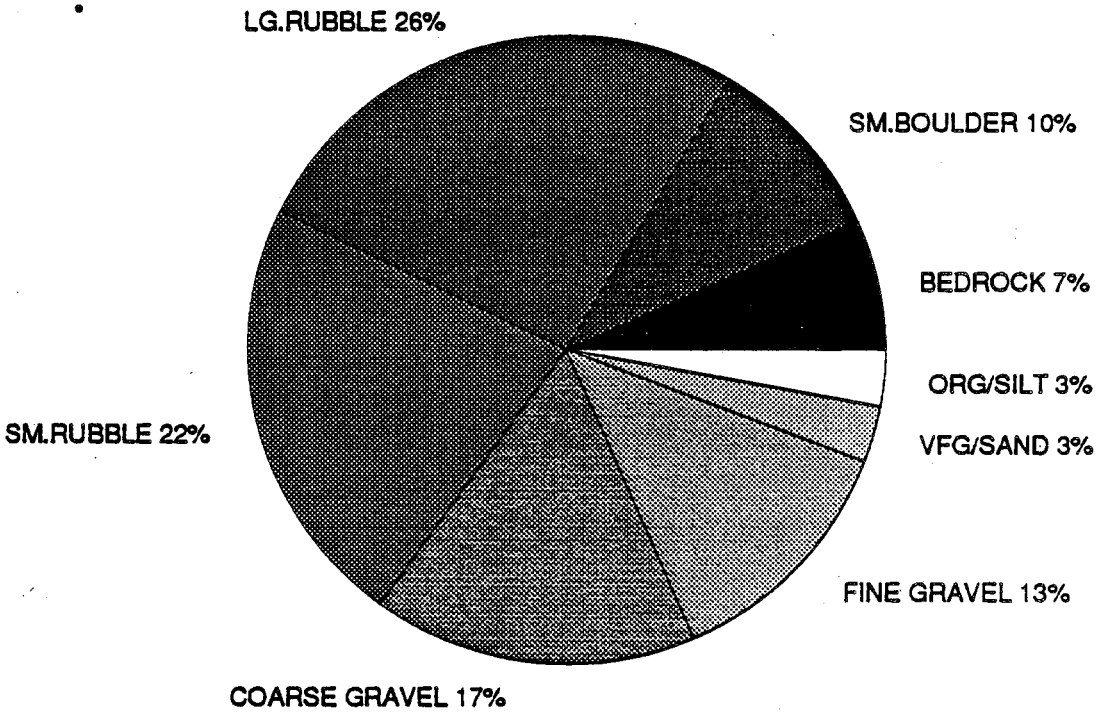
NUMBER OF SAMPLES = 7

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D4 CHANNELS



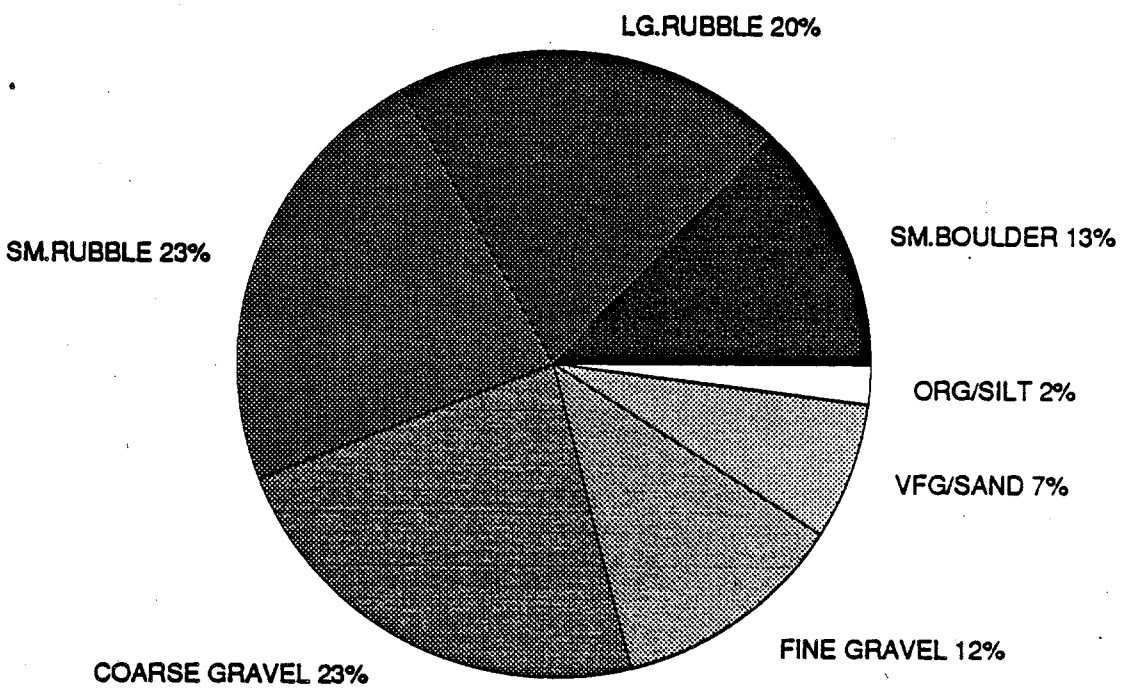
NUMBER OF SAMPLES = 10

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D5 CHANNELS



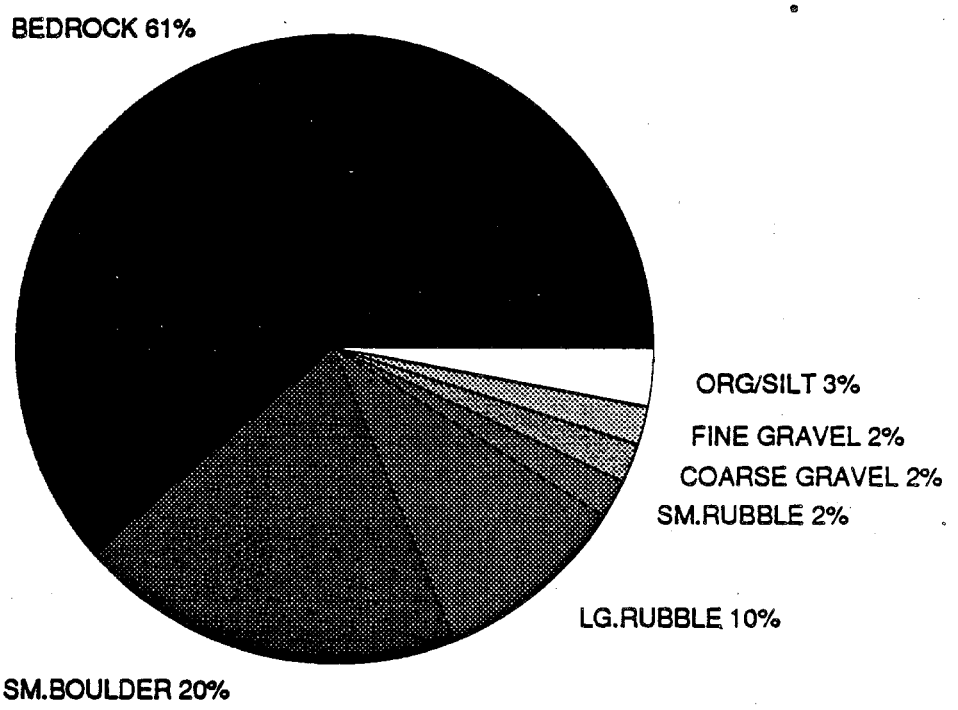
NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D6 CHANNELS



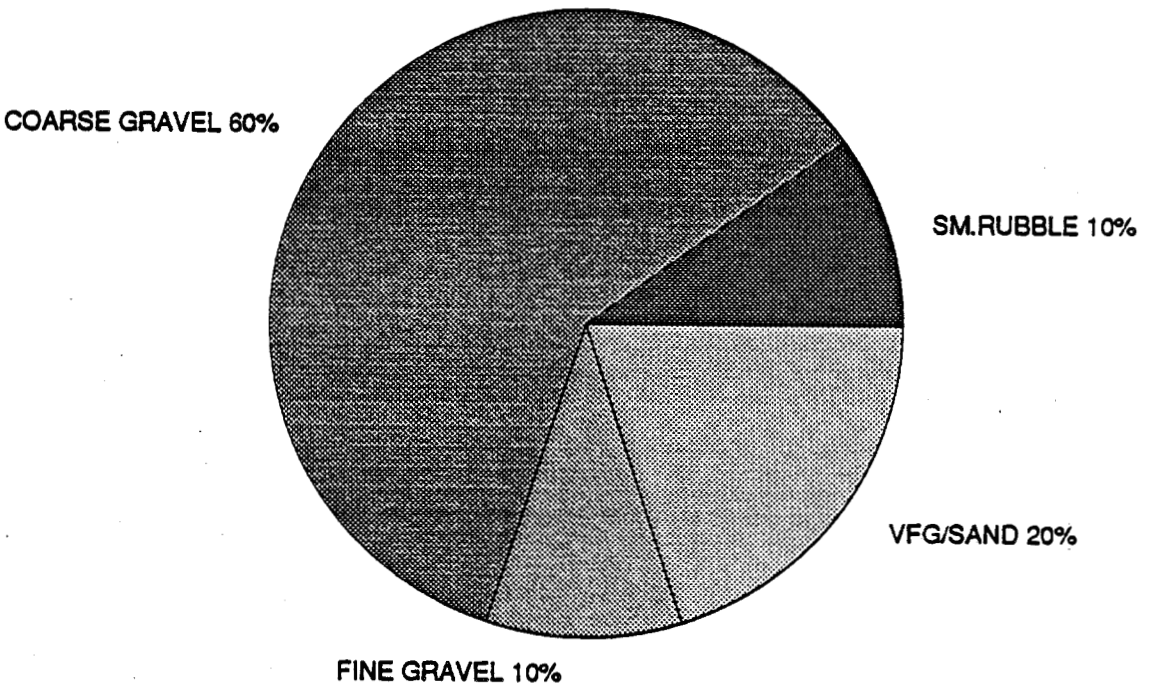
NUMBER OF SAMPLES = 6

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D7 CHANNELS



NUMBER OF SAMPLES = 3

LAND USE DATABASE
SUBSTRATE COMPOSITION OF D8 CHANNELS



NUMBER OF SAMPLES = 1